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TRANSACTIONS AND PROCEEDINGS

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REPORT

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA

(INCORPORATED).

VOL. XXVIII.

[WITH FORTY-FOUR PLATES.]

EDITED BY WALTER HOWCHIN, F.G.S.

PRICE, FIFTEEN SHILLINGS.

Adelaide:

W. C. RIGBY, 74, KING WILLIAM STREET.

DECEMBER, 1904.

Parcels for transmission to the Royal Society of South Australia from Europe and America should be addressed "per W. C. Rigby, care Messrs. Thos. Meadows & Co., 34, Milk Street, Cheapside, London."

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CONTENTS.

	PAGE.
DENNANT, J.: Recent Corals from the South Australian and Victorian Coasts. Plates i. and ii.	1
BASEDOW, H.: Anthropological Notes made on the South Australian Government North-West Prospecting Expedition, 1903. Plates iii. to xxi.	12
DENNANT, J.: Descriptions of New Species of Corals from the Australian Tertiaries. Plates xxii. to xxv. ...	52
LEA, ARTHUR M.: Descriptions of Australian Curculionidæ, with Notes on Previously Described Species. Part ii. ...	77
VERCO, Dr. JOS. C.: Notes on South Australian Marine Mollusca, with Descriptions of New Species. Part i. Plate xxvi.	135
BAKER, W. H.: Notes on South Australian Decapod Crustacea. Plates xxvii. to xxxi.	146
TEPPER, J. G. O.: Descriptions of Some New Species of Orthoptera from North-Western South Australia. No. 1. Plate xxxii.	162
LOWER, OSWALD B.: Descriptions of New Species of Australian Elachistidæ, etc.	168
WOOLNOUGH, W. G.: Petrographical Description of Some Varieties of Granite from near Olary, South Australia	181
WOOLNOUGH, W. G.: Petrographical Notes on Some South Australian Quartzites, Sandstones, and Related Rocks. Plates xxxiii. and xxxiv.	193
TURNER, Dr. A. J.: New Australian Lepidoptera, with Synonymic and other Notes	212
BASEDOW, H.: Note on Tertiary Exposures in the Happy Valley District, with Description of a New Species of *Septifer*. Plates xxxv. and xxxvi.	248
HOWCHIN, W.: The Geology of the Mount Lofty Ranges. Part i., The Coastal District. Plates xxxvii. to xliv.	253
BLACKBURN, Rev. T.: Further Notes on Australian Coleoptera, with Descriptions of New Genera and Species (xxxiv.)	281
BRAGG, Prof. W. H.: On the Absorption of *a* Rays, and on the Classification of the *a* Rays of Radium	298
Abstract of Proceedings	300
Annual Report	306
Balance Sheet	308
Donations to the Library	309
List of Fellows, etc.	315

APPENDICES.

Proceedings, Annual Report, etc., of the Field Naturalists' Section	318
Sixteenth Annual Report of the Native Fauna and Flora Protection Committee of the Field Naturalists' Section	322
Report, etc., of the Malacological Section	324
Report, etc., of the Microscopical Section	325
Index	326

Recent Corals from the South Australian and Victorian Coasts.

By John Dennant, F.G.S.

[Read April 7, 1904.]

Plates I. and II.

About three years ago I was requested by Dr. Verco to determine the corals from his dredgings in St. Vincent and Spencer Gulfs. The material forwarded to me comprised also numerous polyzoa and echinoderms. The former I handed to Mr. C. M. Maplestone, who has already described several new species contained in the dredgings. The echinoderms have been placed in the hands of a specialist, and will, I trust, be dealt with shortly. The present communication treats of the corals in Dr. Verco's collection, together with a restricted Victorian species handed to me by Mr. Mulder. Several of the South Australian corals occur also in Victorian waters.

Of the eleven species to be considered, six are new, and the remaining five have been previously figured and described by various authors.

The occurrence of a recent species of Tenison Woods' tertiary genus *Trematotrochus* is of especial interest, as it emphasises the close relationship which exists between the living fauna of the Australian seas and the earlier one disclosed by the fossils of the tertiary period. This genus is purely Australian, and includes species in which the wall is actually perforate, together with others where the intercostal spaces, though fenestrated in the same manner, have the internal theca entire. Such being the case, the broad distinction usually made between perforate and non-perforate corals breaks down. The wall of a perforate *Trematotrochus* is analogous to the base of *Stephanocyathus*, but its calice is *Turbinolian* in character. The imperforate species of the genus have similar calices, and externally a precisely similar wall.

Another Australian genus, *Holcotrochus*, is represented in the collection by two species, one of which is also recorded from the Muddy Creek tertiaries.

The genus *Platytrochus* was long supposed to be restricted to the Eocene of Alabama; but it is now recognised as both tertiary and recent in Australia, one species being common to the two horizons. Duncan, in his "Revision of the Madreporaria," mentions with a query the Australian seas as a locality for the genus; but on what authority I have been unable to ascertain. Vaughan copies Duncan's remark, though on another page he states that *Platytrochus* is an extinct genus.*

---

* Coral Fauna of the United States. Washington, 1900.

A new *Deltocyathus*, represented in the South Australian dredgings by numerous examples, is the recent analogue of an undescribed fossil form which occurs, more or less abundantly, in certain outcrops of the Victorian and Tasmanian tertiaries.

My examination of the corals referred to in this paper has been greatly facilitated by the loan of the types of some recent species described by Tenison Woods. These are deposited in the Macleay Museum, Sydney, and I sincerely thank Professors David and Haswell (Trustees), and Mr. Masters (Curator), of the Museum, for kindly placing them at my service. I am also under obligations to Mr. F. Chapman for photographs of Woods' types, as well as for information concerning the organisms to which some of the coralla are attached.

In classifying the species account is only taken of families and genera, and the order followed is that given by Duncan in his "Revision."

TURBINOLIDÆ.

Genus Rhizotrochus, Milne Edwards and Haime.

Rhizotrochus radiatus, *spec. nov.* Pl. i., figs. 1*a*, *b*.

The corallum is compressed and flabelliform. The radicles form varying angles with the wall, are six in number, rarely more or less, and surround the central pedicellate base. In young examples they are hollow tubes, which open freely into the interseptal chambers. With age, however, the orifices are much diminished from internal thickening of the tube walls. Of the numerous specimens collected the majority have become detached, but some are still firmly fixed by their long, radiating roots to calcareous algæ or fragments of bivalve shells.

The calice is deep and elliptical, with the major and minor axes in the ratio of 100 to 63. The septa are thin, non-exsert, finely denticulate, and studded with minute, sharply pointed granules. Hexameral arrangement of the septa is evident in very young examples, with the primaries, secondaries, and tertiaries normally developed, the latter being short. As the coral grows, some tertiaries lengthen, and other orders develop, until in the adult there are 20 long septa and apparently as many systems with three cycles in each. The total number of septa in the large example figured is 80, viz., 20 long, 20 of medium size, and 40 very short and thin. The columella is formed of foliated, fascicular outgrowths from the central ends of the principal septa.

The wall is very thin, especially at the margin, and when not covered, as is often the case, by incrusting polyzoa, serpulæ, etc., almost translucent. Broad flat costæ corresponding to the septa are distinct in most examples, beneath a delicate epitheca.

This is marked transversely by irregular growth ridges and a chevron-like ornament.

The dimensions of the type are:—Length of corallum from base of pedicel to summit of wall, 22 mm.; five of its roots are broken, but the remaining one, which is apparently intact, is 10 mm. long, and extends 5 mm. beyond the pedicel. Its calice is 19 mm. long and 12 mm. broad. Though there is considerable variation in the size of individuals, they maintain generally the same relative proportions; young examples are, however, comparatively short.

Specimens of this coral were dredged by Dr. Verco at most of the stations from a depth of 15 to 22 fathoms. My collection also contains two examples from Port Phillip Bay.

Genus Holcotrochus, Dennant.

Holcotrochus scriptus, Dennant. R. S. S. A., vol. xxvi., pp. 1, 2. Pl. i., fig. 1.

This species was described as a rare fossil from Muddy Creek, and the single example dredged in Backstairs Passage shows no variation from the type.

Holcotrochus crenulatus, *spec. nov.* Pl. ii., figs. 4*a*, *b*, *c*.

The corallum is very small, much compressed, and has a glistening, minutely granular surface. A deep sulcus around the base and edges divides it superficially into two plates, which constitute the anterior and posterior sides of the coral, and the two are then joined together by thin, depressed continuations of the extreme lateral costæ. These plates have curved and beautifully crenulated edges, and are roundly pointed inferiorly. As in *H. scriptus*, there are ten broad costæ, which rise considerably above the margin. The interspaces are occupied by ten smaller costæ, which just show as finely pointed projections at the margin of the calice. These secondary costæ answer to the slender rods between the broad costæ of the type species of the genus. On the flat sides both sets of costæ are marked for about a third from the margin, very fine grooves separating them. The costæ of the edges, like the other primaries, are broad from their summits to the calicular margin, but below this they suddenly diminish to the thin sunken lines which connect the two halves of the corallum.

The septa are continuations of the primary costæ, and thus ten in number. They are plain, broad, and free. The calice is elliptical, and the central fossa is large and deep. There is no columella.

The corallum is 3·5 mm. high; its calice is 2·5 mm. long and 1·5 mm. broad.

The collection contains a single example only of this remarkable coral. Like its congener, it was dredged in Backstairs Passage at a depth of 22 fathoms.

Genus Platytrochus, Milne Edwards and Haime.

Platytrochus hastatus, Dennant. R. S. S. A., vol. xxvi., pp. 257-8. Pl. v., fig. 2.

The recent coral can be exactly matched among the fossil representatives of the species from the Spring Creek, Muddy Creek, etc., tertiary beds. The fossils show a slight variation among themselves in the slope of the spear-like projection at the base, but the seven examples of the living form are more uniform in this respect. The latter were dredged in Backstairs Passage at 22 fathoms.

Platytrochus compressus, Tenison Woods, *sp.* Pl. i., figs. 3*a*, *b*.
Conocyathus compressus, Tenison Woods, Linn. Soc., N.S.W., vol. ii., pp. 302-3, pl. v., fig. 1.

The examples, 22 in number, of this coral were dredged in St. Vincent Gulf, Backstairs Passage, and Investigator Straits at 15 to 22 fathoms. Actual comparisons with Woods' type from Port Stephens, N.S.W., show that they belong to his species, which must, however, be placed under *Platytrochus*, and not *Conocyathus*. The supposed pali are the papilli of the columella, which, as in *Platytrochus* generally, invade the lateral boundaries of the fossa. The calice is more narrowly elliptical than Woods' drawing indicates, and instead of the 48 septa shown, it really contains 54.

The South Australian examples vary in size, probably according to age. Several correspond with the type in dimensions as well as in the number of septa, etc., but others, though larger, are proportionally narrower. I redescribe the species, and also figure a full-grown individual.

The corallum is wedge-shaped and much compressed, especially inferiorly. Its sides and edges slope gradually to the base, which in most individuals terminates in a short stalk-like pedicel. There is no trace of adherence.

The calice is shallow, very narrow, and not truly elliptical, as its long sides are straight or sometimes even bend a little inwards, but laterally, that is, at the ends of the major axis, it is regularly curved. The summits of the short axis are usually higher, and often much higher, than those of the long axis. In the calice figured, these axes are in the ratio of 100 to 42.

The septa are exsert, finely granular on their sides, and vary in number from 52 in the smallest to 69 in the largest specimens. There are apparently four cycles and ten systems, of which the

extreme lateral ones are incomplete in regard to some septa. The primaries and secondaries are stout, sub-equal, and larger than the rest, which diminish according to order. According to Woods the septa are arranged in six systems, but I cannot so interpret the calice of any specimen. The columella is longitudinal and consists superiorly of numerous irregularly shaped papilli, which are sometimes, but not uniformly, arranged in three parallel rows. In a damaged specimen some papilli are broken off and the columella beneath is almost solid, and united to the septa.

The costæ correspond to the septa, and are rounded, smooth, and glistening, with narrow but deep interspaces. The primaries and secondaries reach the extremity of the base, near which they are joined by the tertiaries : the latter again are joined by the quaternaries at varying heights on the wall. The more central costæ become gradually narrower and the lateral ones broader towards the base. The costæ of the edges are perhaps on the whole slightly broader than those in the centre of the flat sides. The wall is thin and there is no epitheca.

The large specimen figured is 12 mm. high, and its calice is 9·5 mm. long and 4 mm. broad.

The fossil analogue of this coral is *P. Airensis*, *mihi*, which, however, is smaller and less compressed ; its septa also are more regularly developed and fewer in number.

Genus Trematotrochus, Tenison Woods.

Trematotrochus Verconis, *spec. nov.* Pl. i., figs. 4*a*, *b*.

This small coral is cuneiform and compressed, with a rounded base. Its calice is shallow and elliptical, with the major and minor axes in the proportion of 2 to 1.

The septa are exsert, granular, and in six unequal systems with four cycles. In the two central systems the principal orders are stout and equal, and increase slightly in thickness from the margin to the columella ; the quaternaries are shorter, much smaller, and taper from the wall inwards. The four lateral systems are incomplete, and the septa relatively smaller, except the primaries, which are of full size. The calice figured contains 46 septa, and that of a young individual 40 ; in the latter the quaternaries consist of slender points only.

The columella is essential and longitudinally placed. Superiorly, it is free and nodular, but solid inferiorly, and then fused to processes from the principal septa.

The costæ, which are continuations of the septal orders, are stout and equal, broadest centrally, and narrow in the lower portion of the corallum. On the flat sides nearly all reach the base, but laterally the quaternaries join the tertiaries about midway

on the wall. The interspaces are equal to the costæ in breadth and are regularly crossed by thin transverse bars, which give the corallum the fenestrated appearance characteristic of *Trematotrochi.* The wall is stout, and from a dissected specimen I conclude that it is not really perforate, the pore-like cavities being confined to the external portion of the theca. The wall of the recent coral is thus constructed on the same plan as *T. Kitsoni* and *T. declivis*, fossil species of the genus.

The dimensions of the type are—Height of corallum, 7·5 mm.; length of calice, 6 mm.; breadth of calice, 3 mm. Another example is of equal size, but the rest are smaller. The majority of the specimens are much worn, and were, no doubt, dead corals when collected. They were dredged in St. Vincent Gulf and Backstairs Passage at depths ranging from 15 to 22 fathoms.

Genus Deltocyathus, Milne Edwards and Haime.

Deltocyathus Vincentinus, *spec. nov.* Pl. ii., figs. 1*a*, *b*, *c*.

The corallum is discoid when young and with age becomes shortly cylindrical. The under surface is horizontal or slightly concave, and there is sometimes a small central protuberance. Traces of adherence are common in young examples, and one or two are still attached by the entire base. Quite rarely is there any scar of former attachment on the base of older corals. The wall is perpendicular, or nearly so.

The calice is circular in outline and flat rather than convex from its margin to the abruptly sunken central fossa. The septa are in six systems with four cycles. They have sharply serrated edges, and their sides are marked by parallel rows of pointed granules perpendicularly arranged. They vary in size from the long, stout primaries to the short and comparatively slender quaternaries. The primaries only are free and the rest form six deltoid combinations. All are exsert and rise in arched crests, which differ in height according to order. At the central fossa the primaries extend both inwards and upwards beyond the more gradually arched secondaries and tertiaries. The latter are doubly curved and unite before the enclosed secondary in the manner characteristic of *Deltocyathus.* The quaternaries bend towards and then join the tertiaries about half-way from the margin. The junction of the septa is barely noticeable in perfect examples, like the fine one figured, but when the upper surface becomes worn, as in dead corals, their union is plainly seen.

Conspicuous lobed pali are placed before the primary and secondary septa, and are connected with them by sunken processes; their central ends are fused with the columella. The latter is solid below and superficially either papillary or trabecular.

The costæ are direct continuations of the septa, and, therefore, also in six systems, with four cycles. They are broader than these, sub-equal and prominent on the wall, and with deep interspaces. Their edges are serrated, but less strongly than those of the septa. Curving sharply round inferiorly, they are continued on the base, where they converge from its circumference to the centre, and gradually diminish in breadth. The same deltoid combinations also occur, the primary costæ being free, while the remaining orders unite like the corresponding septa of the calice; the primaries and secondaries reach the centre as very fine lines.

The examples vary much in size. The largest in the collection is 11 mm. in diameter and 5·5 mm. high. From this there are all gradations to the very smallest, which are nummiform in shape and between 3 mm. and 4 mm. in diameter. The type, a comparatively large specimen, is 9 mm. in diameter and 4·5 mm. high.

Examples of this coral were dredged in all but two of the fourteen stations mentioned by Dr. Verco, and generally in great abundance. The depths given range from 9 to 22 fathoms.

The only described species with which it is necessary to compare the present coral is *Deltocyathus Italicus*, Edwards and Haime. As a recent form this is only known to me from the descriptions given by Pourtales, Lindström, and Moseley; but the fossil coral from Cape Otway, identified by Duncan as *D. Italicus*, var. *Australiensis*, is well represented in my collection. As Duncan states, it is in the shape of a very short cone—which agrees with Edwards and Haime's figure of the type specimen from the Tortona miocene. The drawings of recent examples of the same species, as given by the three authors mentioned, indicate also a conical-shaped coral; whereas *D. Vincentinus* is cylindrical, with a flat base and a low, perpendicular wall.

ASTRÆIDÆ.

Genus Homophyllia, Brüggemann (1877).

Duncan, in his "Revision," makes this genus a synonym of *Antillia*, which he established in 1863 for the reception of some West Indian corals; but Brüggemann had already pointed out that *Homophyllia* was distinguished from Duncan's genus by its circular development, attachment, thin epitheca, the dentate character of its septa, and the small columella. Professor Gregory, who has examined Duncan's West Indian corals, doubts the validity of *Antillia*, and divides its species among *Lithophyllia* and *Circophyllia*.* On account of its scanty endotheca, as well as other peculiarities, the species for which *Homophyllia* was founded, viz., Milne Edwards and Haime's *Caryophyllia australis*, cannot enter either of the genera mentioned, and

* Q.J.G.S., Vol. LI. (1895), p. 260.

should, I think, remain where Brüggemann placed it. I observe, however, that its calice is not invariably circular, but sometimes elliptical.

Homophyllia australis, Milne Edwards and Haime, *sp.*
Pl. ii., fig. 2.

Caryophyllia australis, Milne Edwards and Haime, Ann. Sci. Nat., Ser. 3, Zool., Vol. x., p. 320, Pl. viii., fig. 2.
Homophyllia australis, Brüggemann, Ann. Nat. Hist., Vol. xx., p. 310.
Homophyllia australis, Tenison Woods, Linn. Soc. N.S.W., Vol. II., pp. 321, 322.
Cylicia magna, Tenison Woods, Linn. Soc. N.S.W., Vol. II., pp. 325-6, Pl. iv., fig. 3.
Homophyllia (Isophyllia) australis, Quelch, "Challenger" Rep., Zool., Vol. XVI., p. 22.

In connection with this synonymy the following remarks by Dr. Brüggemann are quoted :—" Milne Edwards has mistaken this coral for the young of a West Indian *Isophyllia ;* the description of *Isophyllia australis* (Hist. Nat. Cor., Vol. II., p. 375) has nothing to do with the species under consideration."

There are eight well grown examples of *H. australis* in the South Australian gatherings and others have been dredged in Port Phillip Bay. A worn specimen was also picked up by Mr. Theile on a raised beach at Altona. All are solitary and have always been so. Dr. Brüggemann speaks of neighboring specimens touching each other and becoming intimately united by their sides, but I have never observed such union. Possibly they may sometimes be found on the same piece of rock, but with one exception all those I have seen are independent specimens. Small pieces of bivalve shells, polyzoa, serpulae, etc., are in adult forms still adherent to the base, which is usually much smaller than the calice. A very young example is almost immersed in a polyzoan fragment. The exception just mentioned refers to a young individual which is fixed by its base to the side of the large and perfect specimen figured, but the attachment is merely accidental.

Specimens of this coral from St. Vincent Gulf were forwarded many years ago to the late Tenison Woods for identification, but he did not recognise its identity with Edwards and Haime's species, and redescribed it as new under the name of *Cylicia magna.* In the article containing this description he had already quoted in detail Brüggemann's account of *H. australis*, but, as he makes no reference to the figure given by Edwards and Haime, I presume he had not consulted it. That Woods was uncertain as to the generic position assigned to his species is evident from his concluding remarks. He says, for instance, that Professor Tate, from whom he received the specimens, has not recorded anything of the stolon or mode of increase. There is of course no stolon, the coral being, as Dr. Brüggemann observed, solitary at all ages.

GENUS CYLICIA, Milne Edwards and Haime.

Cylicia rubeola, Quoy and Gaim., *sp.*

Dendrophyllia rubeola, Quoy and Gaim., Voy. de l' Astrolabe. Zooph., p. 97, Pl. xv., fig. 12-15.

Angia rubeola, Edwards and Haime, Ann. Sci. Nat., 3rd ser., t. x, Pl. vii., fig. 6, et t. XII., p. 176.

Cylicia rubeola, Tenison Woods, Linn. Soc. N.S.W., Vol. II., pp. 324-5.

This coral is largely represented in Dr. Verco's dredgings and it is abundant also in Port Phillip Bay. As a fossil species it has been recorded by Professor Tate from the Older Pliocene of South Australia.*

GENUS PLESIASTRÆA, Milne Edwards and Haime.

Plesiastræa proximans, *spec. nov.* Pl. ii., figs. 3*a*, *b*.

The corallum is convex and longer than broad; both its upper surface and sides are covered by crateriform calices, which are so closely packed that the wall between is barely visible. It increases by intercalicinal gemmation. The base is broad and incrusting. On its edges the exotheca, or common plateau of the corallum, is marked by strong wavy lines which are continuations of the costæ of the marginal corallites. The calices are either circular or slightly elliptical, and, though widely open, are not shallow. There is a well marked trabecular columella at the bottom of the fossa.

The septa are in four cycles and six systems, but these are rarely complete. In the calice figured there are 35 septa. All are strongly dentate on their edges and finely granular laterally. The principal orders are stout and sub-equal; while those of the fourth order are short and slender. Some of the lamellæ in one calice may pass over the wall and continue into the next; usually, however, the junction of adjoining calices has a confused appearance owing to the outer ends of their septa meeting at an angle. The pali are long, prominent, lobed, and dentate, and placed before all orders except the last. Their upper projecting edges are free, a wide and deep sulcus separating them from the septal ends; but lower down the two structures are connected by thin processes. The endotheca is scanty and mostly confined to the neighborhood of the columella.

The corallum is 13 mm. high, 19 mm. long, and 10 mm. broad. One of the circular calices measured is 5 mm. in diameter. The single example obtained was dredged in St. Vincent Gulf, at a depth of 22 fathoms.

This species differs in shape, as well as in other respects, from the common *Plesiastræa* found in Port Phillip Bay. The latter is probably identical with *P. Urvillei*, Edwards and Haime.

* R.S.S.A., Vol. XIII., p. 173.

EUPSAMMIDÆ.

Genus Balanophyllia, Searles Wood.

Balanophyllia dilatata, *spec. nov.* Pl. i., figs. 2*a*, *b*.

The two examples of this species are attached to what is probably the lower encrusting portion of the thallus of Lithothammion. Enclosed by the same, or built into it, there is evidence of foraminiferal tests; while its surface shows small patches of polyzoa. The coralla are about 10 mm. apart, but the widely spreading base of one of them slightly overlaps that of the other. The latter corallum (the figured example) is intact; but the former is fractured longitudinally, and the structure of its columella and septa is thereby well disclosed. The habitat of the specimen cannot be definitely given, but as Mr. Mulder found it amongst the dredgings of the late Bracebridge Wilson, together with *Rhizotrochus radiatus*, *Cylicia rubeola*, and other organisms common in Port Phillip Bay, there is, I think, no reason to doubt that it came from that locality.

The corallum is sub-cylindrical and not much compressed, of moderate height, and attached by a large spreading base with a slight constriction immediately above it. The costæ are separated by narrow interspaces, and consist of raised double lines with minute spines on their surfaces and numerous central pores; the interspaces are also porous. The fractured example has a thin granular epitheca on the base and the lower fourth of the wall; but the other shows no vestige of this covering. The calice is elliptical and deep. The columella is large, longitudinally placed, porous, and trabecular rather than spongy.

The septa are in six systems and four cycles. All are perforate, and have dentate margins. The longest and most conspicuous septa are the quaternaries next the primaries in each system. They describe a double curve, and almost meet in front of the enclosed secondary. Here they are connected by a short, horizontal, tabula-like process, and, still continuing, each curves again outwards towards the corresponding quaternary of the adjoining system, and meets it in front of the primary, which is thus enclosed by the long quaternaries on either side. The remaining quaternaries in each system are short, and, curving towards the long ones, join them in front of the still shorter tertiaries at a third to a half from the wall. The primaries and secondaries are stout in comparison with the rest, which are slender and sub-equal.

The corallum is 10 mm. high, and the calice is 9 mm. long and 7 mm. broad.

EXPLANATION OF PLATES.

Plate I.

Fig.

1. *Rhizotrochus radiatus*—*a*, corallum, natural size ; *b*, calice, magnified 1·5 diam.
2. *Balanophyllia dilatata*—*a*, corallum, magnified 2 diam. ; *b*, portion of calice, showing one system of septa, magnified.
3. *Platytrochus compressus*—*a*, corallum, magnified 2 diam. ; *b*, calice, magnified 4 diam.
4. *Trematotrochus Verconis*—*a*, corallum, magnified 3 diam. ; *b*, calice, magnified 6 diam.

Plate II.

1. *Deltocyathus Vincentinus*—*a*, corallum, magnified 4 diam. ; *b*, calice, magnified 4 diam. ; *c*, base, magnified 4 diam.
2. *Homophyllia australis*—calice, magnified 1·5 diam.
3. *Plesiastræa proximans*—*a*, corallum, magnified 2 diam. ; *b*, a calice, magnified.
4. *Holcotrochus crenulatus*—*a*, corallum, magnified 5 diam. ; *b*, end view of corallum, magnified 5 diam. ; *c*, calice, magnified 10 diam.

Anthropological Notes made on the South Australian Government North-West Prospecting Expedition, 1903.

By Herbert Basedow.

[Read June 7, 1904.]

Plates III. to XXI.

The mineralogical duties in connection with my position of Prospector to the Government North-West Expedition did not permit of my making extensive anthropological observations, but the following facts are placed on record to afford some account of the natives of a region of Central Australia that has been practically unexplored, from an ethnological point of view, and to bring these tribes into comparison with those natives of Central and Northern Australia which the reports of the Elder and Horn Expeditions and the work of Messrs. Spencer and Gillen have made comparatively well known. I have divided the paper into two parts, the one being a general description, the other dealing with the question of native art. During our journey I collected a vocabulary of about 1,500 words of the Aluridja and Arunnda (Arunta) languages; but as this paper has exceeded its expected limits I am obliged to defer for the present the publication of that section of my notes. I have, however, included as an appendix a short vocabulary of the Karkurrerra Tribe inhabiting the Musgrave Ranges.

PART I.—GENERAL DESCRIPTION.

Tribes and their Distribution.—The natives that inhabit the north-western corner of the State of South Australia proper and the south-western portion of the Northern Territory, that is, broadly speaking, the inhabitants of the ranges of these regions, are divided into four great divisions or tribes, differing but little, or not at all, in their chief characteristics. The names of these four tribes with their geographical distributions are as follows:—*

i. The Karkurrerra Tribe.—These natives inhabit the greater portion of the Musgrave Ranges, more particularly the southern limits.

ii. The Alinjerra Tribe occupies the territory east of the Musgrave Ranges, extending both north and south.

iii. The Wilrurrerra (Wilruddidda) Tribe inhabits the country west of the Musgrave Ranges, extending north to the Petermann Ranges.

iv. The Ullparidja Tribe.—The Tomkinson and western Mann Ranges form the domain of this people.

* These are the names of the recognised divisions or tribes in the broadest sense, much as one would call them Northern, Southern, etc.

Definite boundaries, determined by natural features of the district, exist between the regions occupied by the various tribes, and the strictest care is maintained not to intrude upon the neighboring territory. It appears, however, that certain tribes are on friendly terms and communicate with one another by casual visitations. This fact was noticed at Opparinna Spring. A native of the Karkurrerra Tribe, who had temporarily been employed as a guide to water by the Expedition, returned to camp in the company of natives of the Wilrurrerra Tribe, and they all appeared to be friendly to one another. Yet tribal feuds seem occasionally to occur. The same native (Immalangenna) accompanied our Expedition to the eastern extremity of the Musgrave Ranges, and it was the intention to take him further south to assist in the location of native waters. To this request he seemed indisposed; for upon leaving the ranges but for a short distance he became very uneasy and soon abandoned the party to hurriedly return to the ranges. He, however, gave a very graphic account of a strife which took place between natives south of the ranges, and which, on being interpreted, was somewhat as follows:—It happened during our absence north of the ranges, that members of the Wilrurrerra Tribe descended to the low-lying country south of the Musgrave Ranges, which, in his own language, are called "Uttnöbella," and, seizing upon several members of the Alinjerra Tribe, who were on a "walk-about," murdered them. The news was quickly carried to the main camp of the attacked natives, who immediately set about to revenge their fallen mates. A party of armed men * departed in the direction of the locality that the aggressors were last seen in. Tracking was difficult, as the aggressive natives are reported to have obliterated their tracks. Nevertheless, at sundown of a certain day, a slight column of smoke, which undoubtedly was that of the enemy's camp fire, was observed rising from a "mulga" † thicket in the distance. Halt was made until the enemy were considered to be fast asleep, and then their camp was cautiously approached to within a short distance. No attack was made until the first glimpse of dawn, when the enemy were suddenly rushed upon in their sleep and every male murdered. The females that were sleeping at the sides of the men were not hurt, but allowed to return to their territory.

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* The tracks of this party were still preserved in the sand on our return to the south of the ranges, and were recognised by our natives as those of: Jinnangalerriknga (Big-foot), the leader of the party, Jinnakularrikna (Stink-foot), Kartakardonne (Bald-head), Kinnegunne, Jinnamureryanna (Crooked-foot), and Muranni.

† The name "mulga," which no doubt belongs to the vocabulary of some Central Australian native tribe, has now been generally adopted by the whites for a common species of *Acacia (A. aneura).*

Subdivisions.—The main tribes are again subdivided into groups, that name themselves after a prominent natural feature that happens to exist within their hunting grounds, such as a waterhole.* For instance, members of the Karkurrerra Tribe were met with in the south of the Musgrave Ranges who call themselves the Odidjuloo, which is at the same time the native name of a large waterhole in the vicinity, though they still recognise that they belong to the Karkurrerra Tribe as a whole.

Hunting and Native Foods.†—As is well known, hunting is the principal occupation of the Australian native's life. The larger game is supplied by kangaroo *(Macropus rufus)*, "marloo," euro *(Macropus robustus)*, "kanalla," wallaby *(Petrogale lateralis)*, "waru," and emu *(Dromaeus novae-hollandiae)*, "kaleya." These, besides being approached by stealth and speared, are hunted in various other ways. A common method is to spear the game as it comes in to drink at a waterhole. At Ulurinna, a native water in the Ayers Ranges, which is situated in a gorge and only accessible from one direction, a fence of brushwood had been built round the waterhole at the further side from the entrance to the gorge, behind which the native, lying in ambush, awaits the arrival of game, driven thither by thirst, and spears it there without further difficulty.

Long fences are also constructed in the mulga scrub by merely piling together branches of this and other bush one over the other. These zigzag brush fences, which may be at times almost a mile in length, assume various shapes in plan, but usually converge to one or more points like the arms of the letter V. The idea is to drive the game into the enclosure, when the arms of the converging fences ultimately lead it to the angle point. A small opening is left at this spot, and a man, hiding close by, spears the game as it emerges.

Having attained the spoil, the natives often express their satisfaction in a remarkable manner. In the Tomkinson Ranges, members of the Ullparidja Tribe were observed to dance about a man, who had killed a kangaroo, and all the while to hold their sub-incised urethras to view, each upturning his penis and widening the slit to its utmost extent.

A remarkable little incident was noted north of the Musgrave Ranges, where a member of the Karkurrerra repeatedly picked up the dung of kangaroo, broke it in two, and smelt it, often uttering the word "kuiya" (no good). The significance of this act I could not definitely ascertain, unless it represented a means of determining the age of the animal excrement, and so to get a

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* *c.f.* "Occasionally they attach the name of some important geographical feature. . . ."—E. C. Stirling: Anthrop., Horn Exped., page 10.

† For the description of Native Water Supplies in Central Australia, see my Geological Report.

clue to the time of the last visitation of the locality by the kangaroo.

Opossums (*Trichosurus vulpecula*), "waiyoda," are found inhabiting the large eucalypts that line the watercourses in many parts of Central Australia. They are hunted by climbing the trunks of the gums and seizing the opossum in, or driving it from, the hollow in which it is concealed. This is often a feat of great skill when the tall, smooth trunks of the gums are taken into account. The usual way of accomplishing it is to cut successively a series of small holes in the bark with the embedded flint ("kunndi") of the spear-thrower, one above the other, and thus gradually ascending to the first limb of the tree by virtually clinging to the bark with their toe and finger nails.

Another method adopted by them is to light a big fire at the base of the tree and wait until the tree collapses by being burnt through. The opossum, if it does not leave its shelter to be speared, is easily captured in the hollows of the tree and killed.

The slow-moving native hedgehog (*Echidna aculeata*) or "tchele" falls an easy prey to the hunter.

Dingos (*Canis dingo*), "papa," are keenly hunted and eaten; they are usually speared at a waterhole. The dingo is also tamed and "domesticated" when taken young. (See Plate IX., fig. 1.) They are, however, of no use for hunting, but are greatly fondled and fed up by the natives. Even the semi-civilized blacks retain this weakness. At Stuart's Creek a wurley (native shelter) that was inhabited by three females came under observation. Sleeping with them, and under the same blankets, were no fewer than fourteen dogs.

Rabbits, which are now plentiful in the southern Musgrave and Ayers Ranges, are a welcome and easily attained source of meat supply. The comparative scarcity of this animal in the Tomkinson and Mann Ranges is a proof of the keenness with which it is hunted there by the natives. They are either speared or killed by hurling sticks* and stones after them when in flight, or are unearthed from their burrows. Extensive diggings for rabbits were encountered throughout the trip, and whenever natives were accompanying the caravan they would never hesitate to examine the burrows for fresh tracks.

Snakes and lizards of all descriptions form daily meals. They are mostly captured by hand. Seizing the snake or lizard by the tail, the native rapidly whirls it above his head, and thereupon dashes its skull upon a stone or log. In one case, I observed a gin (native female), who had caught a large lizard, and was not prepared for the meal, to tie the lizard by one of its legs to a bush, and thus keep it alive until she was ready to cook it. They

* A small kind of specially prepared stick known generally among the whites as a waddy was found to be in use in the Tomkinson Ranges.

are often driven from beneath bushes and "porcupine-grass" (*Triodia*) by setting fire to the same and catching the prey as it endeavours to escape the flame.

All kinds of birds, even the smallest, are constantly sought after to be used as food; particularly do owls and hawks, that inhabit the hollows of gum-trees, fall an easy victim to the ever-hungry native.

When the season is favourable, grubs ("ilguare" and "iljaleti") and caterpillars ("udnamarre") are extensively collected and devoured. The "ilguare" lives on the roots of species of *Acacia* and *Cassia*, and it is interesting to watch a native hunting for these. A long rod with a chisel edge at one end, and often referred to as yamstick ("wannă") is forced into the ground at the side of the main stem of the bush and leverage applied. If the root has been attacked by grubs it will readily give way to the strain, and the native consequently sets to work with his "wannă" and hands to unearth the grub. Less difficulty is experienced in finding the "iljaleti" (larvæ of *Cosssus sp.*) which lives in the trunks of eucalypts.

At the time of our arrival in the ranges the ground was covered with large green caterpillars that were collected by the natives in large wooden vessels ("mika") carried upon the heads of the women.

A "native sweet" which is eagerly sought both by young and old is the honey-ant (*Melophorus inflatus*) or "winudtharră" of the blacks.* (Plate IV., fig. 1.) These curious creatures, nocturnal in habit, live associatedly in colonies below the surface of the ground, usually in thickets of mulga and at the base of one of these trees. The native, on finding the exit from the ants' nest, traces the narrow channel downwards by working with his hand and stick to a depth of often many feet, at which the colony resides. The "honey-ant," which it has been ascertained is one of the workers specially modified, stores honey within itself at the expense of the gatherings of the remaining ants, to an amount disproportionately large when compared with its own size. To permit of this the abdominal portion of the ant swells, according to the intake of honey, until it assumes a globular form having a diameter of a centimetre or more. This globule of honey is enclosed by the integument stretched to a thin membranous skin, along the median line of which the separated, black, thoracic plates are visible. The viscera are compressed into a small space near the vent. The ant is in this condition practically helpless as far as locomotion is concerned. This phenomenal accumulation of honey appears to be a natural mode of storage for times of

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* Compare Baldwin-Spencer. Horn Exped. Cent. Aust. "Narrative," pp. 87-89.

need. The natives are passionately fond of these little luxuries of the bush and spend hours collecting the same. To eat the honey, the ant is grasped by the head, the abdominal portion placed between the lips, and the contents squeezed into the mouth and swallowed. To the palate the first sensation is that of a distinct taste of formic acid, which no doubt is excreted by the ant as a natural protection. This taste is, however, slight and momentary, and upon bursting the membrane a recognition of the taste of rich honey follows.

Eggs of birds, large or small, and of some lizards, whether they be fresh or partly developed, are gathered wherever opportunity is afforded. Emu eggs are relished; these are cooked as follows: A hole is made in the sand big enough to receive the required number, which, after being pierced at the end, are placed aperture upwards in the hole, the intervening spaces being filled up with hot ashes and sand.

Landsnails, "pira," live in the vicinity of the north-western ranges, and, after a shower of rain, very many can be collected in a short time by the black residents, who roast and eat them. Consequently, accumulations of empty shells of these molluscs are frequently found, thickly strewn about the fire places of deserted camps. The most common snail thus treated is the large *Helix perinflata*.

Cooking.—As regards the cooking of the various articles of diet mentioned above: Game, such as kangaroo, is cooked whole. The skin is not detached, and the bony paws may, or may not, be removed beforehand in order to secure the sinews for future use.* The carcase is laid upon its back, completely covered with hot ashes and sand, and thus permitted to cook.† When sufficiently, which often means only partly, cooked the skin can easily be removed and the meat appears tender and juicy. The belly is cut open, and by groping about with the hand the intestines are removed; this, after its contents have been squeezed out with the aid of two fingers, is distributed among the less privileged members of the tribe. The body is next torn to pieces with their hands and the parts distributed to all members having a right to such (the biggest piece usually remaining for the man who divides the meat). Most of the bones, if not crushed between the jaws, are shattered by means of the grinding-stone ("miri") and the marrow eaten.

Grubs and caterpillars are merely thrown upon hot ashes to roast; the latter, however, are permitted to remain there a very short time only, and are eaten almost raw; in doing so the green juice can be seen running down either side of the native's mouth.

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* When cooking the bigger game I noticed that the bones of the hind legs (deprived of the paws) are made to project slightly above the sand.

† Compare Baldwin Spencer, *op. cit.*, page 94.

Vegetable diet is not neglected. One of the common meals is constituted by the small tunicated corms of *Cyperus rotundus*, that grows in the sands skirting the beds of watercourses, and known to the natives as "dunnmördta" The corms are unearthed, usually by the gins, mixed with hot ashes and roasted, then taken, about half-a-dozen at a time, and rubbed between the palms of the hands. This process detaches the brown coverings of the bulb, which are then blown away, leaving behind on the hands the nut like "dunnmördta" to be eaten.

The spore-cases of *Marsilea quadri-folia*, usually known as "nardoo" by the whites, do not appear to be much used for food.

A native meal that was also enjoyed by all members of the Expedition consisted of the "native truffle," or "widida" of the blacks, which was found growing in the sandhills north of Opparinna Spring and elsewhere. This fungus does not generally rise above the surface of the sand, but just raises the soil sufficiently to indicate its position; it therefore only partially resembles the European truffle in this respect. The "widida" are eaten either raw or after being roasted in ashes. In many cases they were fly-blown; this being a proof of the rich, fatty nature of their substance.

Various species of *Solanum* produce fruits which, when ripe, are collected and eaten by the blacks. They call the fruit "winya-winya." A similar statement holds good for the gooseberry—like fruits of *Melothria* or "ilgodda" of the natives, the fruits of the native plum tree (*Santalum lanceolatum*) called "algullia" by the aborigines, and the red fruits and kernels of the native peach tree (*Santalum acuminatum*).

Seeds of acacia, portulaca, and certain eucalypti are ground to powder, usually with the addition of water to produce a paste, which is then baked.

The leaves of the succulent *Claytonia*, often called "parakylia" by the whites, and *Portulaca ballonnensis*, popularly known as "munyeroo," are frequently eaten, especially when water is not close at hand.

The dry fruits of the native fig tree (*Ficus platypoda*) are also eaten.

The slender stalks and leaves of a small plant that is usually found creeping up the stems of mulga when chewed have quite an agreeable, sweetish taste; they are for this reason continually being picked and chewed by the native folk, who call the plant "päuyu."

Galls upon mulga (*Acacia aneura*) and bloodwood (*Eucalyptus terminalis*) trees, and commonly known respectively as "jarrulge" and "errikollbolla," are eaten by the blacks. The former is found on various species of *acacia*, and varies in size from that of a pea to that of a walnut. The whole of the growth,

with the exception of a small kernel-like structure in the centre containing the insect, is edible. The taste, though slightly eucalyptine, might be compared with that of a "tasteless apple." The bloodwood "gall apple" is a nodular, woody, and warty growth, the inside of which is hollow, and contains, besides the parasite, a sweetish juice. The inner layer of the coat of this "apple" is white, soft, and edible.

The flowers of many plants are at times gathered, and the honey sucked from their calyces. Women and children were observed to do this.

The seeds of the kurrajong (*Brachychiton Gregorii*) are roasted and eaten, while the young roots are chewed in case of need.

The native always eats the whole, or at least as much as he possibly can, of the proceeds of one day's hunting—never having a moment's thought about to-morrow's *menu*.

The properties of the dry leaves of pituri* (*Duboisia Hopwoodi*), the so-called native stimulant, which is known to the natives of this region as "peturr," have already been discussed by various writers. In this case, also, it is chewed or sucked in the form of rolled plugs. These plugs, when not in use, are stored behind the ears of the owners thereof, and are often passed from one to the other and successively sucked. The males only were observed to partake of this stimulant.

Physical Features.—The stature of the natives of the tribes considered is, generally speaking, small; fairly well developed from head to hips, the legs being less so. At the time of our sojourn in the ranges the condition of the blacks was excellent, this being the result of the extraordinarily good season. The average stature varies considerably. The tallest men were found among the Ullparidja, in the Tomkinson and west of the Mann Ranges, two members of this tribe having been noted to be over 6 ft. high†; others being not much short of that height. Yet, at the same time, dwarfs—adult men—under 5 ft. high appear among the same people. The females vary less in height among themselves, averaging about 5 ft. 4 in. The tallest female was met with south-east of the Musgrave Ranges, a member of the Karkurrerra Tribe bearing the native name of Ptumpalenna, who stood close on 5 ft. 9 in. in height.

The facial features are of the typical Australoid type that has often been described, though the repeated encounter with men

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* See also Rep. Horn Exped., Anthrop., p. 61; A. J. Higgin: Proc. Roy. Soc. S.A., 1903, page 202; and Rep. Elder Exped., Anthrop., page 293.

† Lindsay, Palmer, and Stirling have noted exceptionally tall natives from other parts of Central Australia. See Anthrop., Horn Exped., p. 16.

having the so-called "Jewish type" of nose is worthy of note.*

The development of hair is, for the most part, good, the majority of the men wearing long black beards. The males wear the hair of the head long, either loose or tied up into a "bob" or chignon with hair string. This is padded with emu feathers, and is utilised to carry in its centre various small articles of use, such as flint chips, kangaroo sinew, and the like. The hair of the old gins is usually thin on the top of the head, no doubt as the result of the wear produced by constantly carrying the food or water vessels upon the head. Quite a systematic mode of "doing up" the hair was observed among the young gins of the Musgrave and Mann Ranges. All the hair is gathered on top of the head and tied into a small "bob" above the forehead. A fringe is left, which is ornamented with a number of seeds of the bloodwood (a species of *Eucalyptus*): these are attached by forcing a number of hairs into the aperture of the seed and sealing them down with a small splint and ant honey (Plate III., fig. 5). Quite a series of these seeds dangle side by side from the fringe in front of the forehead, and constitute the "dindula." In some instances the old men were noticed to have developed a very thick growth of short black hairs down the back. The light coloration of the hair of several children of the Ullparidjas was a marked feature.

These natives are of extreme uncleanliness, and they literally stink with accumulated filth, for their bodies have never been washed since the day of their birth. It must, however, be admitted that great and prolonged scarcity of water is one of the normal conditions of their lives. Their hair teems with vermin. Hours are spent in a manner similar to that which I have seen in the case of Ceylon natives and apes in captivity—by one individual searching the other's head for this pest, and deliberately placing the captives into his mouth. Most frequently is to be seen a mother thus searching her infant's head.

Personal Decoration.—Personal decoration does not receive much attention. Chest ornamentations that were observed were usually in the form of a regular arrangement of circles divided horizontally by straight bars, the whole design being drawn with the finger in pipe-clay or ashes (see Plate IV., fig. 5). Compare, further, the designs on Plate XII., fig. 3, and Plate XX., fig. 4.

* This has elsewhere been noted by various observers, as E. C. Stirling: Anthrop., Horn Exped., p. 15. Professor Spencer points out that this similarity is only superficial. The nose, which is sometimes spoken of as "Jewish" in type, is not really so. The hair gives also a patriarchal appearance.

The foreheads of the men are generally coated with charcoal and grease; the bodies of young and old, moreover, receive a covering of fat and ochre, the application of which no doubt tends to keep the skin supple when subjected to the scorching rays of the sun and wind.

The "döllgu wipu" (Plate III., fig. 1) is worn through the hair at the back of the head by the men of the Wilrurrerra Tribe, and consists of a small pointed stick of mulga, round the one end of which the tail skin of a rabbit-bandicoot (*Peragale lagotis*) is wound in a spiral manner and fastened by means of kangaroo sinew to the stick.

Both Gosse * and Carruthers † have reported the use of bone hairpins by the natives of these ranges. They did not come under my observation.

Necklaces ("olindu"), constructed of a number of parallel strands of twisted fur and tied together at the ends with short pieces of twisted human hairstrings, are generally worn. The separate strands are thickly coated with a paste of emu fat and ochre (Plate III., fig. 2). The females, more particularly the younger, in addition wear the "puttarra," a longer necklace, which, after being wound once round the neck, further passes underneath the left shoulder of the girl. (See Plate VII., fig. 1).

The "wilkarru," consisting of a series of parallel strings of fur tied round the forehead, frequently adorns the men. It is usually constructed of opossum or rabbit fur. Strands of twisted (human) hair are further wound tightly round the stomach and upper arm by the men, the former being employed when out hunting to carry various weapons and game, the latter more usually for a corroboree decoration. The women usually have to supply the men with the hair requisite for the making of these strands.

The men commonly, though not invariably or constantly, wear as an appendage, fastened at its knot to the pubic hairs and partly covering the penis, the flat tassel-shaped "moiranje," constructed of human hair or rarely of rabbit fur ‡ (Plate III., fig. 3).

Personal Mutilation. — Personal mutilation is universal. Horizontal scars upon the chest and oblique scars dipping towards the centre upon the shoulder blades are general, the latter being usually restricted to the females ("tchipare"). The same is true of the cross scars upon the upper arm ("ngarlarrekin").

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* Rep. and Diary of Mr. W. C. Gosse's Cent and West. Expl. Exped., 1873; Parl. Paper No. 48, House Assemb., 1874.

† Report to Surveyor-General, Adelaide, 1892.

‡ See also, Stirling: Anthrop., Horn Exped., vol. iv., page 108; Spencer and Gillen: The Native Tribes of Central Australia, page 572; and Helms: Anthrop. Elder Exped., Trans. Roy. Soc., S.A., vol. xvi., page 246.

The nasal-septum is pierced in the case of either sex. This operation in certain cases takes place at the age of about 18 or 19 years. After the puncture, a rod of mulga, sometimes referred to as a "nose-stick," and in this region known as "delonngu," is inserted and shifted from time to time to prevent the hole from closing, and on special occasions the rod is replaced by a bone. The "nose stick" is not worn daily, but very often a native may be observed to pick a small green twig from a bush and wear it in the place of the former.

The custom of knocking out either one or two incisors was noticed to be generally practised. The most common tooth that was removed appeared to be the right upper lateral incisor; some times the corresponding tooth on the left side, and at times both teeth had been removed.

When a boy attains the age of about 16 years the operation of circumcision ("delldinge") is performed upon him. About this ceremony as practised by these tribes I was able to gather a little information from the natives, which, if their account may be relied upon, is as follows:—The boy is for some time prior to the operation kept apart from the main camp and tended by an old man. On the evening of the event, which no women or children are allowed to witness, he is brought to the side of the fires that have been kindled on the selected ground, when an old native, usually the father of the gin who is to be the future property of the boy, rushes upon the scene. This man, making hideous grimaces, with his beard upturned and held between his white teeth,* and rolling his eyes in a fierce-looking manner, advances towards the lad, holding in his face the sacred "wanningi,"† which up till that time the boy has not been allowed to see. The sight of the "wanningi" may therefore be considered an introduction to manhood. The boy, having been thrown upon his back, is held down to the ground by other men of the tribe, who securely clasp him by legs, arms, and head while the act of circumcision is performed upon him by the fierce-looking man with a sharp flint splinter. When the prepuce has been detached the operator holds it between his fingers in front of the blaze for a short time, then (according to the description given by the natives) quickly swallows it.‡ The ceremony is accompanied by monotonous songs, the words of which were supplied me by a native of the Karkurrerra Tribe:—

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* Compare E. C. Stirling: *op. cit.*, p. 172, "The beards being pushed between the teeth."

† This "wanningi" appears to be precisely the equivalent of the waninga described on pages 230 and 231 of Spencer and Gillen's "The Native Tribes of Central Australia." For a description of this ceremonial object, see page 28., and Plate III., fig. 4.

‡ See also E. C. Stirling: *op. cit.*, page 172.

Gunditi mangaroo mangoralle
Illa kuta dīlkunndalle
Gunngudda gudanne innandāāllē
Tchunatche pērē amanme amanni
Kurerre ami imanne kaditi imanni
Kalingu wiginnti wigiliunburne alunma giraitchere
Munda giraitcherī manda ngunnzi wanapale
Alunma allaitcheritcherī jadunn burari madunn burbari
Aiyumba umbi madata dadi.

The operation of sub-incision ("kallokundana") takes place subsequent to that of circumcision. The urethra is slit downwards from the glans with a sharp splinter of flint. Hot ashes are thrown over the wound, which is later treated with emu grease. I was unable to elicit any reason for this mutilation. On questioning through an interpreter, the general reply was that the population is thereby not checked; it is merely a custom handed down by their ancestors, and about which even the native himself knows little or nothing.

Healing of the Sick.—The custom of bleeding from a vein of the forearm* at the bend of the elbow, known as "marrepa," was noted at least for the Karkurrerra Tribe. It seems to be mainly adopted in cases of sickness. The blood, which is collected in a water vessel ("mika"), being both smeared over the painful part of the sick man's body and given him to drink. As a result of the operation many natives bear small scars at the site of puncture of the forearm.

As regards other methods of healing the sick, considerable faith is attached to the magic influence supposed to be exerted over the affected part of the body by various inert objects when in the hands of the so-called medicine man or "nangarri." In this connection the "darreke" receives most attention. This instrument or rod is made from the bone of the leg or arm of a dead man. Touching the sick man with the "darreke," the "nangarri" imitates the dull, half-guttural call of the emu,† and the sufferer considers himself convalescent.

In a somewhat similar way the obsidian bombs,‡ which are known as "pandölle" or "kaleya-korru" (emu-eye), are employed.

For internal complaints of the stomach a process of fumigation is resorted to. The invalid is made to rest over a smouldering fire by supporting himself on elbows and knees, in order to

* See also Spencer and Gillen: The Native Tribes of Central Australia, page 464; and Stirling: Anthrop. Horn Exped., page 181.

† Spencer and Gillen, *op. cit*, report the "medicine man to assume the form of an eagle hawk."

‡ In Tison and Howitt's "Kamilaroi and Kurnai" rounded (generally black) pebbles are mentioned, which are supposed to be of general magic power.—Page 251. Very likely these pebbles are obsidian bombs.

permit the warmth and smoke of the fire to impinge freely upon his bare belly for a considerable time.

For wounds of all descriptions a universal remedy is emu fat and ochre, which really appears to be a most effective application. Broken limbs they cannot "set." On several occasions natives were met with who had previously broken a leg. The bone had grown together again in a distorted and awkward position. The natives referred to limped very badly, and used a stick to assist them in walking.

Diseases.—The natives, without exception, were healthy, and happily free from those contagious diseases which have become so general among the blacks nearer to civilization. What was at first mistaken for a widely distributed skin disease proved to be nothing more than scabs and slight wounds, produced by carrying the firestick too close to the body while in motion; the hot air and burning particles blowing against the body cause slight burns on the skin, which are subsequently made worse by irritation through scratching.*

What is rather an annoyance to the natives are the various kinds of prickles and seeds of grasses entering the soles of their feet and breaking off at the base. The embedded point produces inflammation and suppuration around it, and causes pain. Many an hour is spent at the camp-fire in removing such prickles from the feet, the native every now and then emitting a subdued "irr," partly expressing pain, and partly disgust or temper. The method adopted by the natives of walking one behind the other where possible is partly on this account, namely, to minimise the risk of picking up prickles with their feet.

An unusual case came under notice north of the Mann Ranges. A boy, about seven years of age, had a very large scar covering about half the area of the upper skull, over which the growth of hair appeared to have been permanently destroyed. The scar was not unlike that produced by a burn.

Weapons, Implements, etc.—In the making and use of implements and weapons the tribes encountered during the expedition were particularly primitive, more so, apparently, than in any other part of Australia. A fair amount of hunting is done with the simple aid of stones and sticks, which are used to hurl at the smaller game. Boomerangs, waddies, shields,† and other important weapons recorded for different tribes are not known, as far as

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* Compare Helms: Rep. Elder Exped. Trans. Roy. Soc., S.A., vol. xvi., page 242.

† H. Y. L. Brown reports that shields are employed in the Musgrave Ranges: Rep. Trip Warrina to Musgrave Ranges. Adelaide: by Authority: 1889; and W. R. Murray writes: "I have seen no shields or stone axes here."—Extracts from Journs. of Explorations by R. T. Maurice. Adelaide: by Authority: 1904, page 19.

observation went, to any of the tribes that inhabit the north-western ranges.

The chief weapon used for hunting and fighting is the spear ("oiritchanna"). In this weapon, which is about 8 ft. long, the shaft is made from the wood of *Tecoma australis*, the blade at the top and the barb being of mulga. It is composed of three segments, the lower ("daparra"), central ("oiritchanna"), and upper (the blade or "talta"), connected by binding together with kangaroo sinew. The native names of the respective parts are given in the annexed figure. (See Plate IV., fig. 2.)

The spear may or may not have the barb or "nunngu." Another form of spear, made of a single piece of *Acacia*, with a flattened blade at one end and without a barb, is used more for killing animals in bushes, etc, than for hurling with the spear-thrower ("mero").* The process of straightening the rods used by the natives in the making of spears is ingenious. The curved portion of the rod, after being well greased, is placed over a stone and completely covered with a mixture of hot sand and ashes. Having frequently turned the rod, the native, after a short interval of time, seizes it with both hands, one on either side of the ashes, and by holding it such that the convex side rests upon the stone exerts a downward pressure from above at each end of the bend. Repeating the operation several times, and skilfully turning the rod about in the ashes, he ultimately straightens the rod perfectly. The process may be compared with the steaming of timber.

The spear-thrower ("mero") is wide and concave; none of the flat and narrow forms of many parts of Central Australia were found. It has a flint-chip embedded in porcupine grass gum ("kedi") at the handle, and very often a small rim of similar material around the handle, a short distance away from its end. In using the implement, therefore, the hand of the thrower clasps the handle between the two specified portions of gum. The names of its parts are given on Plate IV., fig. 3.

Two kinds of wooden food or water vessels or cradle-shaped carriers, frequently called coolemans by the whites, are in use, large ("mika") and small ("dokollko"), the former for receiving various articles as game, roots, and other gatherings of the day, the latter more for scooping water. Water is sometimes carried in the "mika" for long distances; in this case grass and leaves are put into it to prevent the over-splash and consequent loss. They are always carried by the gins, who balance them upon their heads while walking and hunting. They were found to be

* This form of spear is, for instance, used in the hunting of the rabbi cited by Murray,—*Op. cit., page 19*—as it "can be approached within a spear's length when crouching in a bush, and is easily impaled without necessity of throwing the spear. . . ."

invariably made of soft wood, usually from the bark of eucalypts.

The so-called yam sticks ("wannă"), which are used in general both by male and female (more usually the latter) to unearth roots, lizards, grubs, etc., are made very large in size. Some specimens were 6 ft. or more in length.

A useful implement was found among the belongings of the Karkurrerra Tribe. It consisted of an ordinary rod of mulga, to one end of which was attached, by binding with kangaroo-sinew, a small spade or chisel-shaped piece of iron roughly ground into shape (Plate III., fig. 6). The iron had been sharpened along the cutting edge, and had been made narrower at the opposite end—such that it could be more easily bound to the rod of mulga. The iron had no doubt been obtained from the hoops of an abandoned water keg, or suchlike, of a former expedition. This implement was useful both for digging and for sharpening spears, etc.

The native hand mill consists of a grinding-stone, "miri," usually a water-worn pebble three or four inches in diameter, worked by hand upon a flat slab of rock, "tchewa." (See Plate IV., fig. 4.) The motion is not circular, but backward and forward. Not only is the hand stone used to grind up various seeds of acacia, eucalyptus, portulaca, and other plants, but also to crush the bones of cooked meat to secure the marrow. The hand stone is usually carried about by the gins in their "mikas"; the lower slab is, however, not generally transported, on account of its weight, a suitable slab or the level surface of a rock *in situ* in the proximity of the ranges being not difficult to find.

Stone knives ("gadorg" or "nyilla") used for the various acts of mutilation that are practised require no detailed description. They are merely sharp chips of flinty rock (chalcedony), of very variable shape and size, derived from the "Desert Sandstone" formation. None of the well-made trigonal "knives" that have been recorded from the MacDonnell Ranges and elsewhere came under my observation. The small flint chip ("kunndi") embedded in the handle of the spear-thrower ("mero") has already been referred to; it is most frequently used in the scraping into form and pointing of spears, and the making of other implements.

Fire-making.—The implements and methods used for the making or kindling of fires are multifarious.

In the first and simplest case the use of the firestick is universal. This consists simply of a piece of bark or a dry stick glowing at one end. It is carried about in the winter wherever the natives go, each member carrying his own. Directly a halt is made, a fire is lit, in day-time to cook the game, at night to supply warmth during sleep When camp is left a fresh stick is taken from the fire. The stick is carried in the hand with a waving motion from side to side, in front of the native. When

moving about in the dark this motion is continual in order to keep alive sufficient flame to light the way. A large body of natives moving at night in the usual Indian file, and each carrying the burning stick in the way described, forms a striking sight.* The firestick will naturally not be so constant a companion during the summer months.

The actual process of fire-making, depending upon the principle of heat development by friction upon the abrasion of two pieces of wood, is employed in various ways.

In one case a perfectly dry rod of mulga is cleft at one end, the split enlarged on one side and packed with dry blades of grass. The implement thus constructed is called "pinjilere." A spear-thrower ("mero") is placed with its edge over the fissure directly above the dry grass and at right angles to the length of the rod, and rapidly rubbed backwards and forwards. Ultimately the friction causes the wood to char at its edge; particles are detached by the abrasion, it begins to smoke by slight combustion, and eventually a tiny detached spark falls upon the dry blades of grass At this moment the native ceases to work the "mero," and forces the spark into a flame by gentle blowing. When the spark has "taken," the contents of the cleft are emptied on to a small heap of dry grass and leaves upon the ground, and by continual blowing a rapidly growing flame is produced.

Dry roots of trees (mulga) are similarly used. A root, about eighteen inches long, has one end rounded off; this is placed in a small hole in a second piece which is kept firmly resting against the ground by the native who sits beside it. This he achieves by placing the side of one foot over one end of the root, and the knee of the opposite leg upon the other end. At the same time he rapidly twirls the loose root between the flat palms of his hands, the rounded end of this rod fitting or subsequently adapting itself to the depression or hole in the lower root. The wood-dust that accumulates by the abrasion eventually begins to smoulder, and finds its way along a small groove leading out from this hole; thence it falls upon a fragment of bark placed below the groove, and is kindled into a flame as described above. The hands of the native, by virtue of the downward pressure exerted upon the root, gradually find their way from top to bottom of the upright root. They are then rapidly replaced to the top and the half-backward and half-forward rotation restarted.

The Making of Strands of Fur, etc.—On several occasions twisted strands of fur that are variously employed by the natives have been mentioned. Opportunity was afforded to watch the

* Witnessed on the evening of May 22, at Mount Davies.

making of such strands by the natives at Opparinna.* The loose fur (which in this case was that of opossum) is spread out on a clear patch of sand and beaten for some time with small sticks, which have been prepared by breaking green twigs from a bush and holding them in hot ashes for a short time, thus enabling the bark to be readily removed with the flint of the mero (spear-thrower). This process of beating makes the fur soft and incoherent. Two small sticks previously used for beating are then converted into a cross-shaped spool by biting a hole through the centre of the shorter stick and pushing the end of the other through it to a distance equal to about one third its whole length. A small quantity of fur is next taken up with the left hand, a little of it drawn out with the thumb and finger, and with the flat of the right hand rolled along the thigh of the native, who is in a sitting position. At the same time the fingers of the left hand draw out more and more fur, the right hand continually rolling as it comes, until a fair length of coherent string has thus been produced. The native frequently spits on to his right hand and thigh to make the fur catch better. The small length of formed string, which is still in communication with the incoherent fur, is next wound crosswise across the intersection of the arms of the spool; then, holding the fur end of the string in the left hand, which keeps up the regular supply with thumb and finger, the right hand skilfully twirls the spool. This process serves to twist the string more efficiently than the preliminary rolling of the fur with the hand. The string by this means rapidly forms and lengthens, and is from time to time wound on to the spool for convenience of handling until the required length is made. To remove the strand the small arm of the spool is simply pushed upwards and off of the longer. The coil is placed round the wrist and is ready for further treatment or working up if required.

To make a necklace ("olindu") two strands of a length of string are twisted together, and this doubly-twisted strand folded several times upon itself, and each end being tied with a short string of twisted hair (usually human). These two short ligatures further serve to tie the necklace at the back of the neck. The separate strings of the "olindu" are further thickly coated with red ochre.

After the above description, the method of construction of the ceremonial object previously referred to as "wanningi" may be easily understood. Having secured a good length of string, a small cross-like frame is constructed, similar to the spool

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* Compare the method described by Spencer and Gillen in "The Native Tribes of Central Australia," page 613; E. C. Stirling: Anthrop. Horn Exped., page 100; and W. E. Roth: "String and other Forms of Strand, etc.," North Queensland Ethnography, Bull I., by authority, 1901.

previously described (the arms of which vary from 6 in. to a foot in length). Starting from a centre at the point of intersection of the two arms of the cross, the string is wound successively from one arm to the other, passing once round the arm at each point of contact. This winding is continued until completed, as shown in Plate III., fig. 4, the end of the string being loosely tied by a simple knot to the nearest arm of the cross.

Manner of Life.—In general, the natives live exclusively in the open. No form of protection from above is resorted to, except when compelled by continued rainfall to construct primitive huts or native wet-weather shelters. (See Plate V., fig. 1.) These are constructed after one and the same principle, though on slightly different patterns. The usual plan of construction is to ram an uprooted dry trunk of mulga into the sand in an inverted position, so that the horizontally branching roots are at the top. Making this the central support, branches of mulga and bush are placed in a slanting position between the roots at the top, the extremities of these branches forming a more or less complete circle at the surface. An opening is left on the leeward side big enough to permit free access. The spaces and gaps between the branches are filled up with small bushes, grass, and *triodia* tussocks, and on top of all sand is thrown. The floor of the hut is scooped out, the sand being banked up along the walls to keep the water from flowing in, and a fire is kept burning inside. The height of such huts is about 5 or 6 ft., and the base 9 ft. in diameter.

Very often the branches are merely placed around a standing tree as a central support, and now and again the branches are simply made to rest against one another. Sometimes the shelter is made by piling branches and bush either upon the overhanging limbs of a tree or in such a manner as to connect two adjacent bushes.

Brushwood shelters ("youo"), which are employed every night, are constructed by throwing together a few branches of mulga or other foliage at the windward end of the native's camp, towards which end the sleeper always rests his head. In sleeping he makes a fire on either side of him, and scoops out a depression in the sand for his body to lie in. If several individuals sleep side by side, a fire is made between each pair of bodies as well as at either end of the row. This alternate position of fire and man is economical, as each fire serves to warm two natives, one on either side. The positions, moreover, occupied by the natives when sleeping collectively receive distinctive names according to whether they are central ("mbuppola-indoma"), that is, having another man lying on either side, or at either end ("ituppulindoma") of the row of sleepers. (See Plate IV., fig. 6).

The men who possess wives sleep with their families apart from the main body of men. When a native sleeps with his lubra only two fires are employed, one in front of either person, the backs of both lying in close contact along the centre. When a child is present it occupies a position in front of its mother, usually clasped within her arms. When the weather is extra cold additional fires are lit at the feet of each individual, who in this case curls himself up and places his hands between his thighs to keep them warm.

A remarkable fact is that in cold weather the native, if he has been given any article of clothing, cannot be induced to sleep with it on during the night, although he may be shivering with cold. During the day, however, when it is tolerably warm, he will be quite willing to keep on any article of white man's clothing.

The systematic plan of their camps has apparently impressed the minds of the natives themselves, as in several cases it was represented in their rock drawings. (See Plate XIV., fig. 7.)

The native, after he has consumed his evening's meal, does not take long to fall to sleep. Usually a few members assemble for a short time to talk, the conversation mostly referring to the day's experiences.

Another amusement at the camp fire is the imitation of various tracks in the sand: For instance, an emu track is made by impressing lengthwise thumb and pointer in the sand; then, changing the thumb to the other side without lifting the pointer, a second impression is made with the thumb in this position at about the same angle as the first. Often the pad of the emu foot is added by an impression of the thumb at the intersection of the three toes. A kangaroo track is simple, and made with either finger or toe. A dog track is made with the fingers alone, the thumb making the impression for the pad, and the tips of the fingers those of the toes; the imprints of the claws are added by means of a small stick. A blackfellows' track is made with the use of hand and fingers only. For the imprint of a left foot the right hand is employed, and *vice versâ*. The hand, being held in a half-closed manner, is pressed into the sand on its outer side; this will give the ball and heel of the foot. The toes are dabbed in with the finger tips. Snake tracks are produced by permitting the outside of the hand and lower arm to glide over the sand in a sinuous manner. Various other tracks are prepared with the hand and foot, and I was told that in certain parts a camel track is made out of the imprint left in the sand by the stern of a piccaninny.

A humming chant is often resorted to by several members of the camp, who beat time to their tune by striking two sticks together, until one by one the whole group of natives falls to sleep.

The sanitary conditions prevailing at such a camp, even when the camp is to be stationary for some time, are far from pleasant. The excrementa are deposited in direct proximity to the camp, within a foot or less of the sleeper.

During the hot summer months cave shelters in the neighborhood of permanent waters appear to be frequented and used as dwelling places. The very numerous drawings in such caves and the game traps around the waters bear out this statement.

Marriage Rites, etc.—The number of wives possessed by blacks varies. The greatest number that was observed (and that appeared unique) was three, one or two being the usual number. A fair impression as to the number of members comprising individual families may be gained from the following statistical data of families belonging to natives of the Musgrave Ranges :—*A*, two lubras and three piccaninnies ; *B*, three lubras and one piccaninny ; *C*, one lubra and one piccaninny ; *D*, one lubra and three piccaninnies ; *E*, two lubras and four piccaninnies.

The methods adopted by the women of carrying their children are various, and all are used with equal frequency. In the first case the child sits astride on its mother's hip, clinging to her arm or neck for a support (Plate X., fig. 1) ; the second method is that ordinarily known as riding "pickaback" ; and in the third instance, remarkable in its way, the child is placed in a lying posture behind the lubra, the legs of the child being placed under the forearm of the lubra at one side and its head treated similarly at the opposite side, while very often the child seizes one of the breasts for a support. This method permits the mother free use of both hands (Plate VIII., fig. 2).

The lending of wives is a common custom.* It appears that the custom signifies an act of hospitality and friendly relation ship between the parties concerned. At Pundijarrinna, a native soakage well north of the Musgrave Ranges, a party of the Karkurrerra Tribe had camped not far from the main camp of the Expedition. Upon visiting their camp I was somewhat surprised to see the old man of the tribe coming towards me with a young gin, and giving me to understand that I might take her with me as my own. This act on the part of the native was merely to show the friendly feeling the tribe had towards the white men.

Moreover, a corroboree was instituted for our benefit by the same natives. Fires were lit at the corners of an oblong enclosing a clear space, and we were told to sit down. Three men, apparently the most respected, who had disappeared in the darkness, suddenly reappeared at the further fires, having ornamented their bodies with short, broad, white bands of ashes

* Compare Spencer and Gillen : The Native Tribes of Central Australia pages 74, 96, 97, and 98.

across their abdomens and one additional band on either thigh (one individual had three bands across his right thigh). By this time all the females were kneeling at the nearer set of fires, and began beating their hands in regular time. This they did by seizing the wrist of one arm with the hand of the other, and causing the palm of the grasped hand to strike over the region between the upper part of their thighs, which were pressed closely together.* This produces the dull but effective note which accompanies the monotonous singing of such ceremonies. The songs were introduced by the following verse :—

Immandale shēri shēri 'mandale,

the same words being continuously repeated time after time with the same monotonous tune. The men, on the other hand, had seated themselves in a row between the further two fires, with their legs drawn up and crossed in front of their bodies. With a stern countenance they moved their heads from side to side, keeping time in so doing with the song of the lubras, but uttered not a word. Suddenly and simultaneously they jumped up, and, smiting the left hand at regular intervals with a small bundle of grass and flowers held in their right, they began stamping slowly towards the females ; the beating of the latter, the clapping of the hands and the stamping of the men all being performed in time and accompanied by a slight grunt on the part of the men. In this manner they proceeded right up to the gins, and then with a vigorous final beat of the hands they turned short and quickly walked back to the further fires to start the stamping and beating towards the gins afresh. The same proceedings were repeated over and over again. Strict seriousness was maintained during the time that the men were stamping, but when they had reached the lubras and were retiring to the further fires yells and laughter accompanied their actions. Other songs which were later resorted to are :—

Elunmā allaitchērī shērī
Binndipeyndĕ ngannyēparlĕ binndipeyndĕ ngannyēparlĕ
Inbanā marrukurrilbă ānī
Pulleyinā ŭrarillbillāwarē
Ngunnyiparlĕ awŏnnaparle 'wŏnnaparle
Wanăpare larrindi ngunderī wunndēril.

A boy, about sixteen years of age, who had not yet been initiated was kept isolated from the camp, while a younger boy, about eleven years old, was permitted to take part in the proceedings. After the lapse of some little time the white men were asked to join in the stamping with the blacks, and general satisfaction was shown upon fulfilling their wish. This no doubt

* Compare E. C. Stirling : Anthrop., Horn Exped., page 74.

is the manner of procedure when neighbouring tribes or groups of natives visit.

Further words or verses that are sung at various corroborees were supplied to me by an old native. They are as follows :—

Sung only by the old men :

Tchinganalēri kootetū ngātatu araună panganyĕno
Tchinganalēri karăma allbürnā allbinya allyērillyĕrinna.

By the young men :

Awangā anörre ōtannamanni unndi oolarri ennō

All together :

Ngŭrra nganngē nganengă
Ngātă awankā kārū rinpī rērrinje
Alanoo kūrū innă innă ngata tunna āwangannyĕ ngata
Ngurră nganngē innyā kombēră mbarē
Jengaal garinjan ngarrawurrūbāne dedinmān
Yĕrrĕpōmatch wanganyĕ arrau murra murra wanganye
Unnja oolanna indawa oolannă pomatchī wanga wanganye
Dömmă langannī lōkē umbeyallĕ
Ngalēli warrĕ winbā yālunnă
Karkŭrrĕrră imburreka ālönnē immanjētidē
Wālū kūrarrē ngingannyĕ Alinjērra arinna alböranna
Witidī inmānī ngarrāwurrepālandĕ manno
Pala akrīkă ăkwitchū pārinnă winbinkch kwitchu parinna
Nunnba attūtunna yawŭlgăranna Karkurrerraralle ullgarannă
Jillgārē alinjella ngaralinna jillgā arinjella larinna
Nbērētch jinbērenn ălillderekarī nbērē jinberenn nderrēkalē ēūlare unnbūlane
Kutchū ngarinnă wanganyĕ warangililljo wanganye yānō.

The meanings of the above verses I was unable to ascertain, although several words included therein are familiar—notably the names of the two tribes, Karkurrerra and Alinjerra.

Naming of Native Children.—Each child receives a name. In many cases this name ends in what appears to be a diminutive ending, viz., "-inna." When the child grows up this ending is often dropped. For instance, a young girl of the Karkurrerra Tribe was called Unnrubinna ; an old woman of the same tribe, Unnruba. Many natives have received names that allude either to deformities of the body or personal characteristics.* Examples of this class of names have been cited on page 13 :— Jinnakularrikna (Stink - foot), Kartakardonne (Bald - head), Jinnamureryanna (Crooked-foot), and Jinnangalerrikngа (Big-foot).

* *c.f.* Stirling : *op. cit.*, p. 167.

Naming of Natural Objects.—Many native words have had a direct origin in their formation. They are imitative of the calls of birds, express characteristic actions, or imply similarity to other familiar objects. The bell-bird (*Oreoica petroica*) is called "ban-ban-balelle," the value and distribution of the separate syllables of this word corresponding to the never-ceasing call of that bird. So also the mopork* (*Ninox boobook*) is called "kore-gore," which name is in allusion to the sound of the nightly call of the bird. A blue hawk goes by the name of "kaleya gadabongu," signifying "emu-egg-breaker," from the fact that this bird is known to steal and eat emu eggs. *Sarcostemma australe*, to which white man has given the name of "milk bush," on account of its milky sap, the natives call "epi-epi"—"epi" ordinarily meaning a female's breast.

Naming of Heavenly Bodies.—Further may be noted the formation of names for the heavenly bodies by comparing them with earthly objects. The Southern Cross is compared with the claw of an eaglehawk (*Aquila audax*), receiving the name "Warrida-jinna." The Coalsack, situated close to the Cross, is compared with a resting emu, and consequently the name "Kaleya-pubanye" has resulted. The Milky Way is talked of as a water-course or creek-bed, viz., "Karu."

Silent Correspondence.—The strict silence that has to be observed while stalking game has given rise to silent correspondence by means of signs and gestures.† Thus a native, having come upon a fresh track of a kangaroo, wishes to convey the fact to his companion, some little distance off, without producing, at the same time, any cause to attract the attention of the game. This he achieves by imitating the leaping of the kangaroo with his hand—at the same time representing the direction of the track and the distance which separates the individual imprints in the sand. This, in other words, informs the second native whether the kangaroo was in full flight or leisurely hopping along. Similarly the winding track left in the sand by a snake is indicated by a zigzag motion of the hand in a direction corresponding with the course of the track. A peculiar method adopted to indicate upon asking the direction in which a certain thing or natural feature is situated is to turn the head facing in the particular direction, protruding the lips in an ugly, snout-like manner and using either of the words "würnma" or "illa," according to whether the object is far away or close at hand.

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* The bird that gives the familiar "mo-poke" call is now generally recognised to be the boobook-owl (*Ninox boobook*), although up till recently it was supposed to be the tawny shouldered frog-mouth (*Podargus*).—See Campbell: "Nests and Eggs of Austr. Birds": 1900.

† See E. C. Stirling: Gesture or Sign Language, Anthrop., Horn Exped., p. 111.

The mode of beckoning, too, is peculiar. Instead of the upward and inward motion of the hand, as practised by the white man, the native does the reverse—the hand is moved downward and inward.

Burial of the Dead.—The dead are interred* with great mourning ceremony. A native grave was seen in the Musgrave Ranges in which a woman had quite recently been buried. Close to the grave existed the place of wailing, where the mourners had made martyrs of themselves by inflicting wounds upon their bodies and had upturned the earth with their hands during their song of woe. All the signs of the performances were still preserved. The grave, in which the corpse had been buried a few feet below the surface, had been filled up with earth and a circular mound erected over it to indicate the spot. On the summit of the mound the implements of the gin—a yamstick ("wanna") and a cooleman ("mika")—had been stuck in the sand in an upright position, almost as a tombstone might be erected. (See Plate VI., fig. 1.) All the belongings of the gin, moreover, were hidden among the branches of the trees close by. A singular feature of the grave was that, on the northern side of the mound, a hole passing straight down to the body, and only loosely covered at the surface with a few branches of mulga, had been left open. The object of leaving this hole open I was not able to ascertain, but Professor Spencer subsequently informed me that a similar hole is left in graves in other parts of Central Australia to permit of the exit of the spirit of the dead person. In any case it would greatly facilitate the unearthing of the body by the wild dogs. No native was encountered within miles of this grave, although tracks not many days old were plentiful. The superstitious beliefs and fear concerning the dead, it may be mentioned, are astounding. The fact that I had collected a native's skull, which had been disinterred by the dingos at Opparinna Spring, was quite sufficient to induce an old blackfellow and family camped close by to desert the locality in terror. No gin, moreover, is on any account allowed to even mention the name of either a deceased father or husband.†

Tradition and Folk-lore.—Further, the country abounds in tradition—tradition in contradistinction to history. All their complicated rites and customs have been handed down year after year without apparently conveying any real conception to the

* Compare Spencer and Gillen: "The Native Tribes of Central Australia," p. 497.

† Compare the statement: "The name of the departed is by no means ever mentioned, not out of respect, but out of fear" ("The Folk-lore, Manners, Customs, and Languages of the S. A. Aborigines," p. 27); and, "This is not, however, strictly true as regards the Arunta Tribe" (Spencer and Gillen: *op. cit.*, p. 498); also, E. C. Stirling: *op. cit.*, p. 168.

natives as to their significance. Of equal interest is the native folk-lore, which is often connected with certain physical features of the land. Gosse's Waterhole, on the Marryat, is known to the natives as Würmikattidinji—a word which draws attention to the fact, so far as lore goes, that the waterhole is inhabited by a huge snake, which, however, no native remembers having ever seen. Mr. Carruthers, in making reference to the scarcity of native camps at Ernabella Spring, in the Musgrave Ranges, states*:—"We found very few old native camps at this place, the reason being, from what I could gather from the blacks, ... a superstitious dread of 'cootachies' (devils), who, they imagine, inhabit the waters and caves in this locality."

Pastimes.—The native mind is not without constructive reasoning for the entertainment of his children during his leisure. Kurrekapinnya Soakage, in the Ayers Ranges, has evidently been a favorite camping ground of the natives when other surface-waters in the neighborhood have become dry. The very numerous designs sketched upon the roofs and walls of the shelters close by more than support this statement. It was at this native soakage well that a smooth track running for some distance down the inclined surface of a bare granitic outcrop at once attracted my attention, the cause of which, however, was not at first obvious; but my curiosity on this point was satisfied at sundown, when a little native girl called Unnrubinna, in the company of her mother, made her way to the well, and, while the adult was engaged in collecting water to take to her camp, the girl seized a bundle of rushes and, in all haste, made for the top of the track. Sitting down upon the rock, and placing the rushes underneath her, she began a slide down the incline of gneiss the pace of which gradually increased right down to the soft bed of sand at the base of the hill. The track, therefore, represented a native "toboggan." The girl continued playing in this manner for a considerable length of time, and I think the smoothness of the rock along this track may, without doubt, be ascribed to the effects of the continual abrasion produced in this manner for many years past. We have thus an instance of contemporaneous evolution of sport, when one considers the similarity of this pastime of the natives to the practice of sliding down staircase railings and inclined embankments by the children of the civilised world. (See Plate X., fig. 2.)

Other Peculiarities.—As regards rumors reporting the natives to be cannibals, little reliable information could be gathered. On putting the question direct the usual reply would make reference to the Wilrurrerra. It appears, however, that during very bad seasons the youngest of the children are killed. This act, Prof. Spencer holds, is performed to provide food for an elder child.

* Report to Surveyor-General: Adelaide *Observer*, Jan. 16, 1892, p. 9.

All natives have a wonderful power of mimicry. How true to nature the cries of birds can be imitated in the supposed healing of sickness has already been alluded to. Gestures are imitated with no less accuracy.*

The arrival of our party of white men caused among the natives no little excitement and often fear. The great "waipella" (whitefellow) had been personally seen by several of the older members of the various tribes that had come into contact with former exploring expeditions, the first of which dates back as far as the early seventies of last century (Gosse and Giles). Those who had not seen the white man before were, nevertheless, well acquainted by tradition with his feats. First and foremost, the deadly effect of firearms was generally known; most of the natives encountered would shudder at the sight of a rifle or revolver. In this respect considerable difficulty was at times experienced in getting natives to stand while they were being photographed. They apparently mistook the camera for a gun, and would endeavor to escape or crouch behind one another.† Yet in the most remote districts natives were occasionally encountered who would not show any signs of discomfort at the sight of firearms. That they had seen or at least were familiar with the existence of the white man is evident from the fact that "white-fellow tracks" are found among their crude cave-drawings.

The historic beast of burden, the "kamellie," forms an object of admiration and respect.‡ It is the ambition of the native youth to have the privilege of a short ride upon the hump of a camel, although he is quite unaccustomed to that kind of locomotion.

An infant held in the arms of her mother became so terrified at the sight of a white man that violent hysterical crying ensued. The breast of the mother being of no comfort to the little one, the gin lifted the head of the child, pointed in a direction in which camels were to be seen grazing, and uttered the words, "Kamellie, kamellie!" The sobbing of the piccaninny was at once converted into a broad smile.

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* In the Tomkinson Ranges a body of some two dozen natives approached the camp with their dingos. I was anxious to find out if the wild dog would pay heed to the generally adopted mode of attracting the canines. Upon applying the call I was somewhat startled to find the whole body of men imitating my actions to a nicety! On another occasion all the members commenced clapping and blowing on their hands upon seeing one of us do it to remove the dust from his hands after carrying rock specimens. The serious demeanor maintained during these antics adds strikingly to the effect upon an observer.

† Plate IX., fig. 2, shows an instance of this kind. The face of a terrified native will be observed peeping from behind the old man immediately to the side of his left shoulder.

‡ I subsequently learnt that a former exploring party had five camels speared by natives in this region.

PART II.—NATIVE ART.

During the passage through the ranges several opportunities were afforded of examining native cave drawings and primitive rock scratchings. The latter are made by simply scratching an angular fragment of rock upon the surface of a larger outcrop in such a way as to result in the formation of crude designs and imitative reproductions from nature.

The first example of this type of native art was found in the Mann Ranges in the form of scratchings made upon the surface of an outcrop of diorite. (See Plate XI., fig. 1.)

Starting consideration of the designs with the top row from left to right, we have as the first a hooked design,* whose interpretation is ambiguous, although possibly it is intended to represent a snake track. Following this we have one of those simple figures to which white man so readily gives the meaning of a "corroboree circle," being at the same time in utter ignorance himself as to its precise significance. The large emu track on the right speaks for itself. Following up the bottom row a similar U-shaped curve lends no further clue to its explanation than the hook immediately above it.† The next group is undoubtedly meant to represent a bustard (*Eupodotis australis*) track; the elongated central toe of the hinder imprint and the incomplete connection of it with the front are surely drawn to imitate the manner in which the bustard lazily scrapes the central toe along the surface of the ground when walking leisurely and unmolestedly. The meaning of the largest and central design, representing two circles one within the other, crossed by two arcs that intersect almost at right angles, is unknown. The last representation must be considered the same as the second.

Scratchings of a similar nature and also upon the surface of diorite were observed in the neighbourhood of Mount Crombie, south of the Musgrave Ranges. (See Plate XI., fig. 2).

These designs were comparatively fresh. Chippings of the rock and other signs indicated that the site of the markings had

* This curve and the one below it are not unlike the "Churinga Ilkinia of the Ulpmerka" figured by Spencer and Gillen: The Native Tribes of Central Australia, fig. 133. Their conspicuous position, however, does not support this explanation.

† Similar U-shaped curves have been noted by Helms: Trans. Roy. Soc. S. A., vol. xvi., Part III., Plate XII.

formed a temporary resting-place of the natives, apparently while out hunting. The figures were in all probability made while the blacks were in conversation with one another, and their meaning is not clear. They are quite similar to the sketches reproduced by Helms in the Anthropology of the Elder Expedition,* and to the "unripe plum" of the Plum Tree Totem of the Ulpmerka, figured by Spencer and Gillen.†

On the southern side of the Musgrave Ranges, upon a vertical wall of granite rock, directly above Naveena Rockhole, designs have been scratched that must be considered, in part at least, foreign to the district, inasmuch as they include representations of boomerangs, weapons that are not employed by the natives of these ranges. The groups of circles that accompany the boomerang-like figures may possibly represent chest ornamentations. (See Plate XI., fig. 3.)

At a soakage well east of Artootinna, in the Everard Ranges, a peculiar scratching upon the bare granitic rock resembled the shape of a bow and arrow. This is the only sketch of the particular kind at the locality, although a few chains west of the spot a small cave contains a few rock drawings on its walls.

Now and then (*e.g*, Ernabella and Giles West Camp) emu tracks were found carved in the bark of gum trees.

At Kurrekapinnya Soakage, in the Ayers Ranges, very numerous cave drawings exist, which will be described further on. Among these, many crude designs had been drawn with a fragment of charcoal. (See Plate XI., fig. 4.) The drawings include representations of bustard and kangaroo tracks (the elongated central toe of the former being characteristic of some of the figures), concentric circles, necklaces ("amuttara"), and certain inexplicable and other delineations, of which better illustrations follow.

At Ulurinna Native Soakage Well, moreover, upon the granite walls of a small cave several drawings in charcoal and red ochre of the pattern shown in figure 5 of Plate XI. were found. What they are meant to represent is a matter of uncertainty, although one or two of the figures approach the shape of a kangaroo track. They have been drawn with charcoal and are surrounded by a border of red ochre.

Upon teaching some members of the Karkurrerra Tribe, in the vicinity of Erlywanyewanye Waterhole, south of the Musgrave Ranges, the use of a pencil, I succeeded in obtaining a few original drawings on paper. These, during the time that they were constructing the designs, would repeatedly ejaculate their

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* *Idem. op. cit.*, Plate X.b, page 263.

† "The Native Tribes of Central Australia," page 632, figs. 133, 16.

respective meanings. Fig. 1 contains *fac-simile* reproductions of such drawings :—

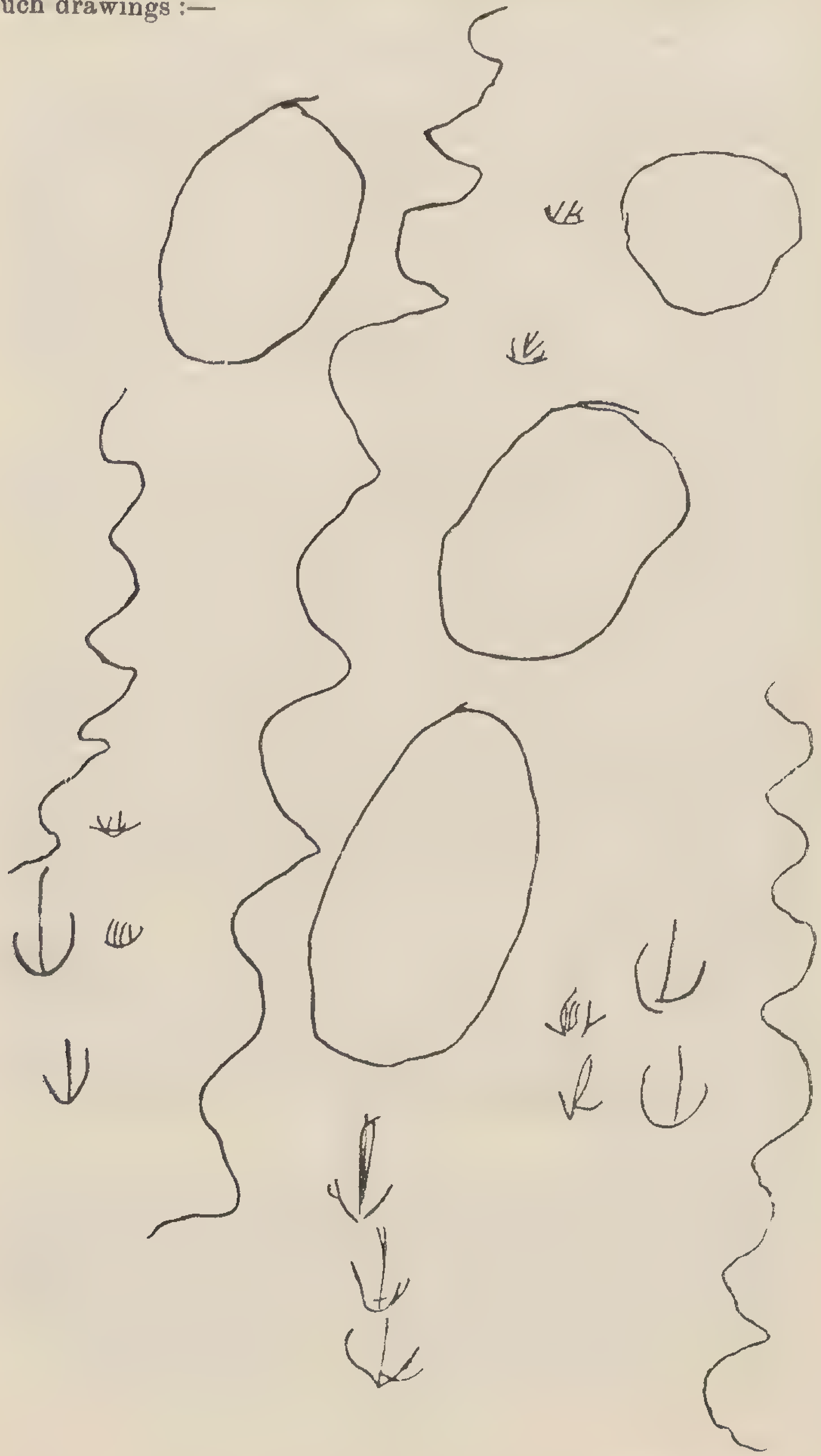

Fig. 1.—Fac-simile of Native Drawings, Karkurrerra Tribe.

The snake tracks, which were drawn while excitedly uttering the word "würmi" (snake), convey no more to the mind than the zig-zag course of the motion of these creatures. The other designs—representations of the tracks of emu ("kalēya"), kangaroo ("kanallă"), and dingo ("pāpă")—need no further comment, except that the dog-tracks are poor and incorrect as far as the number of toes is concerned. The novelty of the use of a pencil must be considered when examining these sketches. The circles were invariably drawn with the explanation of "inma," meaning "corroboree."

Rock Drawings.

To deal with the rock drawings, it will be advisable to consider each of the accompanying plates separately. The drawings have mostly been made in ochre of various tints, charcoal, white ashes, kaolin, and possibly burnt gypsum, mixed with water to produce a convenient paste. They have almost invariably been executed by dabbing it on with finger and hand.

Many of the designs have a real significance, in that they are attempts to represent the external form of every-day objects; some might have assisted to demonstrate graphically a verbal explanation or description; and others have no real significance at all, merely representing a concoction of idle thoughts that pass through the mind of the native. Few of the drawings correspond in form to that of actual objects, with which the natives can hardly be expected to be acquainted. These must be regarded as accidental similarities.

Many of the caves being but two or three feet high, the drawings must of necessity have been executed by the native in a recumbent posture, a fact which makes reproduction of the same into a note-book very awkward indeed. It appears, further, that many of the drawings are made during the hot summer months. The caves in which they were found were usually situated close to permanent waters, and they are no doubt used as a shelter against the sun. That the caves are re-occupied every season is evident from the fact that, in some instances, one design has been painted over the other, time after time, and year after year. The walls have, indeed, in cases, become so covered with drawings, successively painted one over the other, that not even a small portion of the original rock remains visible.

The greater portion of the rock drawings found during the expedition is represented in Plates XII. to XXI., and the following statements as to the significance of their details may now be given:—

Plate XII.—The cave in which these drawings were found occurs in porphyritic granite in Garnet Glen, Mann Ranges. Its walls have become blackened as a result of the frequent burning of fires within the same.

FIG. 1.—For an aboriginal this sketch is excellent. It undoubtedly represents a kangaroo; this being strongly suggested by the powerful tail and large hind legs. The excellence of the drawing lies in the segmentation of the limbs, the distinct snout, and general sense of proportion. Length, 13 in.

FIG. 2 represents a hand, bearing in its centre a red emu track. The hand, which is of about natural dimensions (8 in. long), it will be noted, possesses six fingers. Whether this fact is in allusion to such an abnormal case as cited in the Anthropology of the Elder Expedition* is questionable. More probably it is an arithmetical slip on the part of the native, whose notion about number is so very vague.

FIG. 3.—A chest ornamentation similar to that considered on page 20. The individual circles vary from 1½ to 2 in. in diameter.

FIG. 4.—Two correctly depicted wild dog tracks that have been constructed by employing the imprint of the thumb for the "pad" and that of a finger for the toes. The tracks are each surrounded by a ring 3 in. in diameter.

FIG. 5.—A doubtful design, 3½ ft. in length.

FIG. 6.—No doubt meant to represent a boomerang, although this weapon is not used in the locality. Length, 17 in.

FIG. 7.—Ditto. Length, 12 in.

FIG. 8.—An emu track.

FIG. 9.—On showing this to the blacks they pointed to their ears, which, therefore, it may be intended to represent.

FIG. 10.—This group of designs includes two series of concentric circles ("inma"); a long serpentine curve, probably without any real meaning; and numerous rabbit and bustard tracks.

FIG. 11 depicts a kangaroo track.

FIG. 12.—A long snake track.

FIG. 13.—A boomerang, 3 ft. long.

FIG. 14.—A spiral curve, the outer ring of which joins and approaches a circle. Probably a corroboree decoration, although an eye has been suggested.

FIG. 15.—Poor representations of dingo tracks, the number of toes being incorrect.

This cave further contained, in a separate portion, the design shown in Fig. 2. If the explanation given by a native (not the artist himself) is to be believed, it might represent the route taken by a man when out hunting, or on some other journey. The small, irregular lower figure might, on that conjecture, have reference to some natural feature—such as a native water. Total length of sketch, 4½ ft.

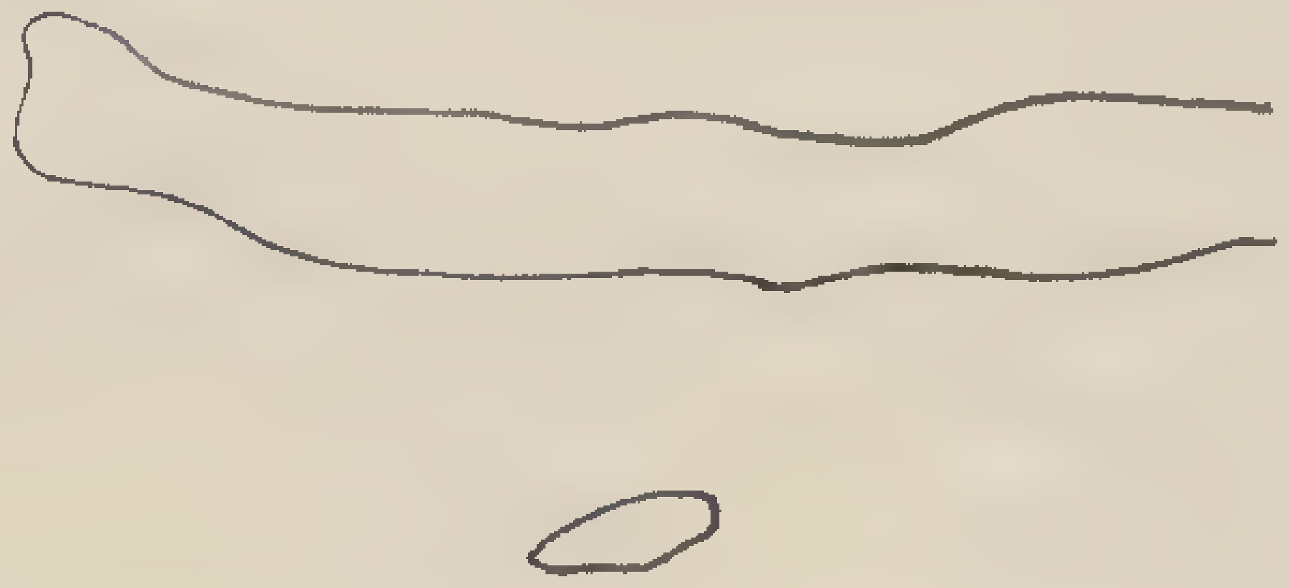

FIG. 2.—AN EXPLANATORY SKETCH BY A NATIVE.

* R. Helms: Trans. Roy. Soc. S.A., vol. xvi., Part III., page 306, Plate XXXVI.

Plate XIII.—Rock shelter north of Mount Whinham, Mann Ranges. This shelter exists high up on the hill slope on the northern side of the ranges, and is determined by an overhanging face of granite.

Fig. 1.—The most prominent drawing is that of a large snake, 7 ft. 6 in. in length, and is conspicuous even from the base of the hill. The drawing is in solid black, outlined with white. Two features of the figure are peculiar: a distinct but incomplete enlargement in the position of the head, and a black spine-like projection from the end of the tail. With regard to the latter feature, Professor Spencer suggests that it probably indicates that the artist intended to represent on a large scale a deaf adder (*Acanthophis*), which occurs in these parts, and is remarkable for the possession of such a spine.

Fig. 2.—This design measures 2 ft. 4 in. by 1 ft. 7 in., and has been drawn in the same colors as the sketch just mentioned; and the only meaning I can very doubtfully suggest is that it represents two crossed boomerangs, the lines of crossing having been omitted.*

Fig. 3.—The imprint or track of a right human foot, the correct number of toes being in this case shown.

Fig. 4.—Possibly this figure was intended to demonstrate a pattern of chest-scarring. It is not without resemblance to the design of the "Plum-tree Totem" figured by Messrs. Spencer and Gillen.†

Figs. 5, 5a, 5b, and 5c are rather good representations of dog tracks.

Figs. 6, 6a, and 6b illustrate the imprints in the sand of a bustard's foot.

Figs. 7, 7a, and 7b.—Kangaroo tracks, some of which show the imprint left in the sand by the side-toe; others are without it.

Fig. 8.—Meaning not apparent.

Fig. 9.—Similar to fig. 9 of Plate XII.; suggesting the shape of an ear.

Fig. 10.—Somewhat similar to fig. 5 of Plate XII.

Fig. 11.—Professor Stirling suggests that this figure might well represent a small "waddy," or throw-stick, though this kind is not actually used in the region.

Fig. 12.—An inferior representation of a snake track.

Plate XIV.—Native drawings found in a large rock shelter in granitic rock at Kurrekapinnya Soakage Well, Ayers Ranges.

Fig. 1.—The meaning of this figure is not evident; it simulates a drawing reproduced by Dr. Stirling.‡ Length, 2 ft.

Fig. 2.—Another doubtful representation. Dr. Stirling has pointed out the resemblance of a somewhat similar figure § to a *fœtus in utero*, without, however, pretending that it is meant to represent this. Dimensions: Length, 18 in.; breadth, 17 in.

Fig. 3.—See Plate XII., fig. 10.

Figs. 4, 4a, 4b, 4c.—Perhaps these designs are meant to represent necklaces ("amuttara"), such as are worn by many of the Northern Territory tribes; or they possibly illustrate the "moiranje," or fan-shaped tassel that is attached to the pubic

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* A similar design appears on Plate XII. of the "Anthropology of the Elder Expedition."

† "The Native Tribes of Central Australia," fig. 133, 2 and 14.

‡ E. C. Stirling: Anthrop., Horn Exped., Plate IV., fig. 8.

§ *Op. cit.*, Plate III., fig. 13, page 189.

hairs of the men.* The drawings vary in length from about 6 in. to 1 ft.

Fig. 5.—Probably a chest ornamentation or other corroboree decoration. The only explanation that I could acquire from a resident native was that of "inma-nuirrti" (corroboree rings). The total length of the design is 3 ft. 6 in.

Fig. 6.—Possibly a diagram of a shield. It is somewhat similar to the one pictured by Mr. Helms.†

Fig. 7.—A very interesting drawing, illustrating, in plan, the method of camping of a black and his gin. The longer curve, on the right, represents the male, the shorter the female, the dots on either side the fires, and the top curve the brush-wood shelter that is constructed at the heads of the sleepers on the windward side of the camp. This sketch was explained to me by a native of the Karkurrerra Tribe.

Fig. 8.—Depicts the tracks of a wallaby that is being pursued by a native from left to right. The paired tracks represent those of the game, and the intervening oblique marks those of the hunter. The design was continued for a greater distance than is shown on the plate.

Plate XV.—Kurrekapinnya Soakage Well (continued).

Figs 1, 2, 3 represent snakes or snake tracks; 4, 5, and 6 being rather doubtful. The large designs are many feet in length.

Fig. 7.—Bustard tracks.

Fig. 8.—Bustard and rabbit tracks.

Figs. 9 and 9a.—Kangaroo tracks.

Figs 10 and 10a.—Similar drawings appear in the Anthropology of the Elder Expedition.‡

Fig. 11.—An emu track.

Fig. 12.—The "circle within circle" design of corroborees (?). The remaining designs are not obvious, though they may, perhaps, belong to the category of those connected with corroborees.

Plate XVI.—Kurrekapinnya Soakage Well (continued).

Fig. 1.—This design, which is 3 ft. in length, suggests the skeleton of a snake, though, but for its great length, it might well be taken to represent a centipede, the obliquely set lines at one end being intended for its "feelers."

Fig 2.—Of unknown significance.

Fig. 3, 3a, and 3b.—Concentric circles. See Plates XII., XVIII., and XXI.

Fig. 4.—A spiral design, probably connected with corroboree decoration.

Fig. 5.—The same explanation as that given for fig. 1 may possibly apply here also; it is 2 ft. long; and it had been done, in the first place, in yellow ochre, and subsequently re-drawn in red.

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* An identical sketch has been reproduced by Mr. Helms in the "Anthropology of the Elder Expedition." He states that it "is undoubtedly meant for a fringed apron, as is worn by some tribes after certain rites have been performed upon the wearer."—Trans. Roy. Soc. S.A., vol. xvi., Part III., page 261. They are certainly like the waist-girdle described by Spencer and Gillen.—*Op. cit.*, pages 572 and 573.

† *Op. cit.*, Plate IX., page 262.

‡ R. Helms: *op. cit.*, Plates IX. and XIII. Compare the drawings of the "Plum-tree Totem": Spencer and Gillen, *op. cit.*, fig. 133.

Fig. 6.—This is not unlike a sketch made for me by a native with a pencil, with the intention of representing a dingo track (referred to on page 40). It is 4 in. long.
Fig. 7 was described as a corroboree mark ("inma") by the natives.
Fig. 8 probably depicts a native camp, as in fig. 7 of Plate XIV., the fires and shelter having been in this case omitted or obliterated.
Fig. 9.—A necklace (?) or fringed apron, as on Plate XIV.
Fig. 10.—Possibly a design of chest ornamentation.
Fig. 11.—Plan of a native camp (see Plate XIV., fig. 7), showing position of fires, but no shelter.
Fig. 12.—Bustard tracks.
Fig. 13.—Similar to fig. 5.

Plate XVII.—Kurrekapinnya Soakage Well (continued). These elaborate drawings filled several square feet in area on the walls of the rock shelter, and probably have connection with one of the sacred ceremonies. They were again simply pointed out as "inma" by the natives.

Plate XVIII.—Drawings upon the roof of a granitic rock shelter at the base of Mount Sir Henry, in the neighborhood of Ulurinna Water, Ayers Ranges. The designs chiefly represent tracks of various animals.

Fig. 1.—A splendid drawing of a snake, 5 ft. in length. The head is markedly differentiated.
Fig. 2.—Tracks, about 4 ft. long, of monitor (*Varanus*) or other lizard.*
Figs. 3 and 3a.—Snake tracks, the latter being 3 ft. 6 in. long.
Fig. 4.—Chain of connected concentric circles.† The largest is 5 in. in diameter.
Fig. 5.—Concentric circles, which have frequently been referred to.
Figs. 6 and 6a.—Dingo tracks. (See Plate XVI., fig. 6).
Figs. 7 and 7a.—Kangaroo or wallaby tracks.
Fig. 8.—Compare with Plate XVI., figs. 1, 5, and 13.

Plate XIX.—Sketches upon the roof of a very low rock shelter, in granitic rock, north-west of Opparinna Spring, Musgrave Ranges :—

Fig. 1.—This group of man and emu tracks probably illustrates a blackfellow in chase of an emu ; at the end of the series (fig. 1a) the two kinds of tracks are intermixed, which, we may imagine, represent the "kill." It will be noted that the man tracks have three toes only in each case.

The remaining drawings require no explanation. They include a large emu track (fig. 2), kangaroo track (fig. 3), a group of emu tracks (fig. 4), and a snake track (fig. 5).

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* See also E. C. Stirling : Anthrop., Horn Exped., Plate III., fig. 3.

† Compare the designs on Plate IX. of the "Anthropology of the Elder Expedition," and the sacred drawings associated with the Honey-ant Totem in the Warramunga Tribe described by Spencer and Gillen in "The Native Tribes of Central Australia," fig. 131, page 631.

Plate XX.—The cave in which these drawings were found is situated a few chains north of that to which those of the previous plate belong, viz., Opparinna, Musgrave Ranges.

Fig. 1.—A good drawing of a snake, nearly 4 ft. in length. It was drawn in red ochre, lined with black (charcoal). The poor state of preservation of this figure has necessitated partial reconstruction of the outline.

Fig. 2.—Doubtful.

Fig. 3.—Upon asking the natives for information about this design, the only reply one could get was "picaninny." If this be a correct interpretation of the figure, the absence of head and legs is remarkable. The striping of the design is, moreover, peculiar. What appears more likely is that the figure is a copy of a striped shirt or guernsey, which may have been presented to the natives by a previous exploring party. To account for the explanation of "picaninny," one might assume that the garment had been used to clothe the child. Dimensions, 20 in. by 29 in.

Fig. 4.—Judging from the symmetry of this design, it in all probability illustrates a chest ornamentation. Under that view, the spiral portions of the design would probably have been painted over the two breasts, and the large broad-arrow-like portion over the abdomen. Its dimensions are: Length, about 16 in.; breadth, 18 in.; diameter, of the circles enclosing the spirals, about 8 in.

Fig. 5.—Probably represents a shield, 11 in. long.

Plate XXI.—Drawings from rock shelters in the Musgrave Ranges. Of these figures, 1, 2, and 3 were from the southern flanks of the ranges not far east of Jacky's Pass; the remainder occur upon an overhanging joint face of granite at Giles's West Camp.

Fig. 1.—The shape of the two ends suggests the head and tail of a lizard, but it seems inconceivable that the artist should have multiplied the legs to the extent he has. It is drawn in charcoal, surrounded by red ochre, and is 19 in. x 7 in.

Fig. 2.—Representation of a boomerang, 1 ft. long. See Plates XI. and XII.

Fig. 3.—Very many feet of these paired kangaroo tracks covered the walls of the cave, and the figure represents portion of a track 6 ft. in length.

Fig. 4.—Concentric rings, alternately red and white in color, the largest 9 in. in diameter.

Fig. 5, 5a, and 5b.—Have been discussed before.

Fig. 6.—Plan of a native camp without the shelter at the head. See also Plates XIV., fig. 7, and XVI., fig. 11.

Fig. 7.—Doubtful.

Fig. 8.—A bustard track.

Fig. 9.—Poor drawings of dingo tracks, the toes being deficient in number in two of them.

Fig. 10.—These figures probably depict the track of a white man's boot, the enlargement at the lower end of the figures representing the heel of the boot. The lowest member of the series is drawn in white (kaolin), the remaining in red ochre.

Fig. 11.—Various designs of kangaroo or wallaby tracks.

In conclusion, I wish to acknowledge my indebtedness to Professor E. C. Stirling, C.M.G., F.R.S., of this city, and Professor Baldwin Spencer, C.M.G., F.R.S., of Melbourne, for their valuable criticisms and suggestions on various points of the paper; and to Dr. J. C. Verco, President of this Society, to whose liberality the reproduction of the accompanying plates is due.

Appendix.

VOCABULARY OF THE KARKURRERRA TRIBE; OR "WONGA-TCHITCHE" (LANGUAGE OF THE TRIBE).

In this Vocabulary the orthographical system of the Royal Geographical Society has been adhered to as far as possible. Any slight additions thereto will be noted.

Language	Wonga
Woman (lubra)	Kunnga
Young woman	Wanyī
Mother-in-law	Wumaru
Belly	Wīla
Eyelashes	Ngimbī
Eyebrows	Ungirri
Nasal fibrillæ	Orrū
Knucklebone	Gunna gunna
Tongue	Gĕllī (Dallin)
Eye	Korru
Nose	Mulla
Ear	Binna
Teeth	Kaditi
Hair	Kātamonka
Beard	Nganngurrŭ
Ankle	Mörtull*
Hand (or Finger)	Mairra
Fingernail	Mairra-pīrī
Foot (or Toe)	Jinna
Toenail	Jinna-pīrī
Knee (or Kneecap)	Mordi
Thighbone	Dundā
Elbow	Gnūkū
Calf	Jirrar
Navel	Pulli
Testes	Okullgĕ
Vulva	Tchuka
Anus	Kunnatörn
Penis	Kürlu
Breast (female)	Epī

Kangaroo (*Macropus rufus*)	Marlu
Euro (*Macropus robustus*)	Kanăllă
Wallaby (*Petrogale lateralis*)	Waru
Dingo (*Canis dingo*)	Pāpă
Tail	Wipū
Ground	Múnnda
Rock	Kartu
Sky	Illkarri
Cloud	Martörri
Star	Kilelp
Moon	Bira
Sun	Jinta
Dark night	Monanka
Noon	Jinta kalkalkū
Dusk	Tchikalkutipa
Venus	Ukurridchikurrid-chi
Southern Cross	Warrida jinna
Wind	Wŏllpa
Creek	Karū
West	Ulbarera
Fire	Wărru
Charcoal	Yölda
Ashes	Ono
Smoke	Ngādī
Act of subincision	Kallokulldano
,, circumcision	Delldinge
Medicine man	Nangarri

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* I found it necessary to employ the modified forms (Umlaut) of o and u, the value of the sound being quite the same as in German.

Spear	Oiritchannă
,,	Kādtī
,, (without the barb)	Winta
Spear-thrower	Mēro
Trough - shaped carrier (large)	Mika (Wira)
Trough - shaped carrier (small)	Dokollkō
Hand stone for native mill	Mirī
Grinding stone for native mill	Tchĕwa
Yamstick	Wanna
Small bone used by medicine man	Darreké
Stone "knife"	Gadorg (Nyilla)
White strands of twisted fur worn round forehead	Wil karru (Nannbā)
White strands of twisted fur worn round arm	Armakurrekĕ
A form of necklace described in the text, passing once round the neck and under the left shoulder	Putörro or Puttarra
Rod worn through nasal septum	Delonngu
Scars on chest	Tchiparre
,, on arm	Ngarlarrekin
Gum	Kĕdti
Ochre	Dürrtu
Operating flint	Kalluwila (Gŭnnditi ?)
Yes	O, owă, u, ūwa, ówau, ūwau (according to emphasis required)
No	Wiya
Mine	Nayuka
Yours	Ngorŭmmba
Another one	Kutipa
To-day	Goarī
Spider	Wŭnnga
Grub	Elljalitti makū
Centipede	Wānajitti
Caterpillar	Anōmarrĕ
Mantis	Gāwall
Butterfly	Benda bendā
Beetle	Mŭttumutt
Grasshopper	Jendilk
Blowfly	Būbūlērī
Lizard (chadny)	Ngabolla

Moloch horridus	Meuerrĕ
Snake	Würmī
Apus australiensis	Dobŭllabŭlli
Emu	Kaleya
Emu-Feather	Kaleya wipia
,, -Breastbone	Ngarrek
,, -Egg	Kaleya ngambu
Curlew	Willō
Flower	Jindā Jindā
Sarcostemma Australe	Epi epi
Eucalypt	Opera
Casuarina Decaisneana	Kurrekarra
"Mulga" (*Acacia aneura*)	Korreku (Parreka)
Acacia seed	Mulle
Portulaca seed	Wākādī
Mulga gall (edible)	Jarrŭllge
Pituri (*Duboisia Hopwoodii*)	Peturr
Water	Kapī
Metal	Tellurambu
Honey (Ant's)	Worma (?)
Spittle	Wīda
Excrement	Kunna
Exclamation denoting appreciation	Hm ! Hm !
Plenty	Ura, Uraku, or Uraku-pu (according to emphasis required)
Much	Punnda
Little	Wimuggitā
Scared	Ngūloo
Be afraid	Nguluringanyē
Be tired	Pullkarringanyē
Leave alone	Wunndī
Give me	Pakenai nguwa, or pākayuā (contracted form)
Walk	Kullpannyē
Run	Wörteböganni
Throw	Wonnē
	Marwonninye
Dig (with stick and hand)	Towalē or towannī
Pinch	Menndī
Kick	Ganndola
Be hungry	Amma (?)
Look for	Ngakolakullpannyē
Laugh	Ennga
Cough	Gonndull
Sneeze	Narretchī (Narretchinnyă)
Jump	Bullgarrē
Cohabit	Tchuka morannī

Arrive	Ngāāliannī
One	Kudū
Two	Kutarra
Three	Munngurru
Four or more	Dūda
Want a drink of water	Kapi mantchegalle
Want to eat	Māīī mantchegalle
Poor fellow!	Wilunnga
My young lubra	Wanyī nayuka nganndtharri
Far	Würnma
Near	Illa
Good	Pullya (Palla)
Bad	Kuiya
Odorous	Punding
Red	Ngallda

ABORIGINAL NAMES.

Names of Persons.

MALE.	FEMALE.
Immalangenna	Werejinna
Nginndawaparrikna	Ngungolganna
Kamanje	Junnjinga
Ngerongabarrennye	Nuranna
Dinjimanne	Unnrubinna or Unnruba
Waikillyarinna	Yarmenndinna
Jetominna	Ptumpalenna
Topintopin or Topintopingna	Mijagardonne
Kontchigorra	Konndiwanna
Wangunnana	Tcherokullyanna
Pimbakuta	Urabonna
Tallgurinnga	Immiarinnya
Yambilpabadonna	Pannjidinna
Tunndabilonna	Immanduranne
Maguaborrange	Perdinnya
Tumarinna	Katchiwalanne
Jinnāngalerriknga	Tudabaiyanna
Jinnakularrikna	Unndabaganna
Kartakardonne	Manmadonna
Kinnīgunne	Karlonda
Jinnamureryanna	Ngarnolin
Murannī	

Names of Dogs.

Dunnidunna	Pinnakki
Bunnibunni	Mäuiru

EXPLANATION OF PLATES.

Plate III.

Fig. 1.—Hair decoration worn by males, and known as "Döllgu Wipu." x $\frac{3}{4}$.

Fig. 2.—Necklace or "Olindu." x $\frac{1}{2}$.

Fig. 3.—Pubic tassel or "Moiranje," worn by males. Natural size.

Fig. 4.—Ceremonial object, known as "Wanningi." x $\frac{1}{2}$.

Fig. 5.—Hair (fringe) decoration worn by females, and known a "Dindula." Natural size.

Fig. 6.—Implement made by natives of the Karkurrerra Tribe. x $\frac{1}{8}$.

PLATE IV.

FIG. 1.—The honey ant (*Melophorus* sp.) distended with honey, or "Winudtharra" of the natives. Natural Size.
FIG. 2.—Hunting spear, or "Oiritchanna," showing the native names of the separate parts (Karkurrerra Tribe).
FIG. 3.—Spear thrower, or "Mero," showing the native names of the separate parts (Karkurrerra Tribe).
FIG. 4.—Native mill consisting of hand stone ("Miri") and grinding stone ("Tchewa") (Karkurrerra Tribe).
FIG. 5.—Native chest decoration. Ullparidja Tribe, Mann Ranges.
FIG. 6.—Diagrammatic representation of a native camp. The positions of the sleepers receive separate names according to whether they are on the outside or the inside of the row, as follows:
A = Ituppulindoma
B = Mbuppolăïndoma

F = fire
C = brushwood shelter, or "youo"

PLATE V.

FIG. 1.—A native wet weather hut, west of the Mann Ranges.
FIG. 2.—A natural rock shelter, Garnet Glen, Mann Ranges. Upon the roof and sides of this cave the drawings reproduced on Plate VII. were found.

PLATE VI.

FIG. 1.—A female native's grave, Glen Ferdinand, Musgrave Ranges. The so-called "cooleman" and "yamstick" of the deceased can be seen erected on the summit of the mound of earth. A hole in communication with the body exists underneath the dry branches of "mulga" in the foreground. See text.
FIG. 2.—Cave shelter, with aboriginal rock drawings, north-east Mann Ranges. For particulars see Plate VIII.

PLATE VII.

FIG. 1.—Females of the Karkurrerra Tribe, Musgrave Ranges (south). The two adult figures wear "nosesticks," and a form of necklace known as "Puttarra," which passes once round the neck, thence under the left shoulder. Their hair has been gathered into a "bob" in front.
FIG. 2.—Males of the Karkurrerra Tribe, Musgrave Ranges (south). The central figures are boys, not yet initiated. The photo also shows the method of camping, with the alternate placement of man and fire.

PLATE VIII.

FIG. 1.—Males of the Wilrurrerra Tribe, north of the Musgrave Ranges. The plate shows the method of holding spear-thrower and spear, and upward movement of left arm when hurling the weapon.
FIG. 2.—Female of the Wilrurrerra Tribe, north of the Musgrave Ranges, showing a common method of carrying an infant. The Musgrave Ranges show in the background.

PLATE IX.

FIG. 1.—Males of the Ullparidja Tribe, Tomkinson Ranges. The figure on the right is a youth, not initiated, who is being tended by an old man, prior to the ceremony of initiation. The picture

further shows a domesticated dingo *(Canis dingo)* in the background.

FIG. 2.—Natives of the Ullparidja Tribe, Tomkinson Ranges. The old native is explaining the relationship of his family.

PLATE X.

FIG. 1.—Females of the Karkurrerra Tribe, Musgrave Ranges (north). A second method of carrying a child is shown in this picture.

FIG. 2.—A native toboggan on a granite slope at Kurrekapinnya Soakage Well, Ayers Ranges. The girl-picaninny (Unnrubinna) is taken in the act of sliding down the smooth track.

PLATE XI.

FIG. 1.—Rock scratchings on diorite, north-east Mann Ranges.

FIG 2.—Rock scratchings on diorite, Mount Crombie, south of the Musgrave Ranges.

FIG. 3.—Rock scratchings on granite, Naveena Rockhole, Musgrave Ranges.

FIG. 4.—Charcoal drawings, Kurrekapinnya Soakage Well, Ayers Ranges.

FIG. 5.—Drawings, Ulurinna Soakage Well, Ayers Ranges.

PLATE XII.

Rock drawings, Garnet Glen, Mann Ranges.

PLATE XIII.

Rock drawings, north of Mount Whinham, Mann Ranges.

PLATE XIV.

Rock drawings, Kurrekapinnya Soakage Well, Ayers Ranges.

PLATE XV.

Rock drawings, Kurrekapinnya Soakage Well, Ayers Ranges.

PLATE XVI.

Rock drawings, Kurrekapinnya Soakage Well, Ayers Ranges.

PLATE XVII.

Rock drawings, Kurrekapinnya Soakage Well, Ayers Ranges.

PLATE XVIII.

Rock drawings, Mount Sir Henry, Ayers Ranges.

PLATE XIX.

Rock drawings, Opparinna, Musgrave Ranges.

PLATE XX.

Rock drawings, Opparinna, Musgrave Ranges.

PLATE XXI.

Rock drawings, Musgrave Ranges.

Descriptions of New Species of Corals from the Australian Tertiaries.

By J. Dennant, F.G.S.

[Read October 4, 1904.]

PART VII.

Plates XXII. to XXV.

FAMILY TURBINOLIDÆ.

Genus Flabellum.

Flabellum medioplicatum, *spec. nov.* Pl. xxii., fig. 2.

The corallum is compressed, especially towards the base and at its lateral edges; these edges are crested, not only inferiorly, as in its near ally, *F. distinctum*, but also superiorly. The most characteristic feature of the coral is a strong medial plication on its anterior and posterior surfaces. This commences at the base, and becomes gradually broader and stronger as it ascends on the sides of the corallum. The base is prolonged into a straight tapering pedicel, which at the point shows a mark of former attachment. The whole surface is covered with a strong epitheca, which is crossed by several well marked transverse bands. These bands are convex and most prominent on the upper portions of the medial plications, where they form a series of crested ridges. Beneath the epitheca the costae are traceable as numerous, faint, and closely packed projections, broad at the summit of the corallum, but gradually narrowing as they reach the base. The central ones are straight, and continue to the extremity of the peduncle; the rest converge towards this point, but at the same time curve gently inwards. The wall is thin and thus easily fractured during fossilization. Owing to this the specimens obtained are all more or less imperfect.

The calice describes two convex curves which meet sharply at the lateral edges. Its major and minor axes are approximately as 100 to 56. In the type specimen one half of the calice is fairly well preserved and shows 50 septa, or 100 for the whole calice. On its medial boundaries the septa are apparently arranged in three orders, of which the first is fairly stout, and reaches to the central fossula, the second thinner and nearly as long, with the third very slender and much shorter. Towards the lateral edges the septa become alternately long and short.

The columella is rudimentary and deeply placed in the narrow fossula.

Height of a tall specimen, 48 mm. The type is evidently broken, and now measures 35 mm. from its summit to the base of the peduncle. The calice of another specimen is approximately 35 mm. long and 20 mm. broad.

Locality.—Abundant in the Spring Creek section.

I have adopted for this species the manuscript name given to it many years ago by my late colleague, Professor Tate.

F. medioplicatum is quite distinct from *F. distinctum*, which occurs abundantly and in good preservation in the same beds. The former not only differs from the latter in shape, but its calice contains a much smaller number of septa.

Flabellum microscriptum, *spec. nov.* Pl. xxii., fig. 1.

The corallum is compressed, pedicellate, deltoid in shape, and slightly keeled at the edges. The epitheca is complete and transversely ornamented with delicate, closely set, arched, and chevroned lines, which are occasionally raised in growth ridges. Longitudinally the surface is marked by very fine straight lines, radiating from the base to the summit. These represent the interspaces of the costæ. The latter are broad, but are only just traceable on the wall. The epitheca of the nearest allied species, *F. Gambierense*, has a similar but less delicate ornamentation.

The calice is narrowly elliptical, and has its minor axis on a higher plane than that of the major. The ratio of these two axes is in the example figured, the largest collected, as 100 to 55. The septa are sparsely granular, and in six systems with five cycles. All are slender at the summit, especially the higher orders. Lower down, the principal septa become stout, and unite across the axial space to form a strong parietal columella. The remainder vary in length according to order, and at the level of the columella are still very thin lamellæ. The wall is fragile, and the specimens found are usually much damaged. Out of 17 examples in my collection I cannot select a single calice sufficiently well preserved to serve for illustration.

Height of figured corallum, 31mm. Its calice is approximately 27 mm. long and 15 mm. broad.

Locality, etc.—In Wilkinson's No. 7 locality, two and a half miles east of the river Gellibrand, to which it is apparently restricted. It is accompanied by *Trochocyathus meridionalis*, Duncan, *T. Victoriæ*, Duncan, and *T. Wilkinsoni* (see post), which so far have only been found in this small outcrop. The only other coral discovered in it is the widely distributed *Flabellum candeamum*, Edw. and Haime. In addition to the corals a few species of mollusca have been obtained, several of which are new and peculiar to the section.

Flabellum Grangense, *spec. nov.* Pl. xxii., fig. 3.

The corallum is pedicellate, conical in shape, compressed towards the base, and scarcely so superiorly. The wall is moderately stout, and is covered with a strong epitheca. The costæ are plainly marked, equal, flat, broad, and separated by fine lines.

The calice is subelliptical, its major and minor axes being in the ratio of 100 to 94. The septa do not correspond to the costæ, but to the linear intervals between them. They are in six systems with four complete cycles. The primaries and secondaries are stout and equal; the tertiaries and quaternaries, especially the last, shorter and smaller. All are marked by rows of large, bluntly pointed granules. A rudimentary columella, formed by the junction of opposite septa, is visible in two examples, both of which are shortened by fracture. In the figured example, which is taller and larger, the columella is wanting, and the septa do not meet. A small fragment of shell has, however, become firmly fixed in a portion of the columella space.

Height, 19 mm.; approximate diameters of calice, 8·5 mm. and 8 mm. Only three examples have been found, none of which have the calice perfect. Though much less compressed than Flabella generally, there can be no doubt as to the genus of this coral.

Locality, etc.—In the Miocene beds at Forsyth's, Grange Burn. Collected by Mr. T. S. Hall and myself. Like the fossils generally in the Muddy Creek Miocene, the coralla have evidently been rolled.

GENUS PLACOTROCHUS.

Placotrochus magnus, *spec. nov.* Pl. xxii., figs. 4*a*, *b*, *c*.

The corallum is large, dense, and much compressed at the base, which terminates in a short, abrupt, flatly pointed pedicel. Above this, the faces incline outwards so as to form a broadly elliptical calice. The coralla are not uniform in general outline, and vary from deltoidal to almost cuneiform. The lateral edges are plain, sharp, and convexly curved from the base to the summit; the angle subtended by them varies according to the habit of the individual from an extreme of about 80° in the broadest to 44° in the most contracted form. The coralla figured represent the two most strongly contrasted forms collected; their faces are inclined in their middle lines at angles of about 45° and 36° respectively. The summits of the minor axes of the calice rise to a greater or less extent above those of the major, according as the examples vary

from broadly deltoidal to more cuneiform in shape. There is a corresponding difference in the actual lengths of these axes, but their ratio is tolerably constant for each individual, and about as 70 to 100. The wall is stout except towards the summit, where it becomes thinner. It is covered by a strong, coarse epitheca, which is faintly marked transversely by a series of broad ridges and corresponding but narrower depressions, having the same curve as the margin of the calice. The costæ are numerous and arranged in sets in which three very fine ones alternate with another slightly larger. They follow the contour of the edges, but can only be traced on the surface of well preserved specimens. In the deltoidal example figured the finer costæ fade away near the lateral edges, while the larger ones become more prominent. On the surface of this corallum, which is the finest collected, I counted thirty-two of the larger costæ.

The calice of an adult deltoidal specimen contains 112 septa of three sizes, viz., 28 stout, equal, and in appearance primary, an equal number thinner, but nearly as long, and 56 still shorter and finer. The calice figured is that of the cuneiform corallum mentioned, and has 54 septa on one side and 50 on the other. They are in 27 sets, two of which contain no septa of the third order. This calice is tolerably perfect, and a number of the primary septa, still intact, rise slightly above the margin. The free edges of the primary septa curve downwards towards the columella, and then descend vertically to bound the central fossa, which is deep, long, and moderately broad. For some distance from their free edges the septa are quite plain, but lower down their sides are marked by closely set, radiating rows of fine granules. The columella is a long, stout, perfectly plain, plate-like structure. It is in the line of the long axis, and being largely free it forms a conspicuous feature in the calice.

The dimensions of the deltoidal specimen taken as type are:—Height, 33 mm.; length of calice, 37 mm.; breadth of calice, 26 mm. The cuneiform specimen, of which both the corallum and calice are figured, is 35 mm. high, and its calice is 29 mm. long and 22 mm. broad. It is an extreme form, the other examples tending to deltoidal in outline.

Locality, etc.—Common in the Upper Eocene or Oligocene of Spring Creek, Victoria.

This species closely resembles *P. deltoideus*, Duncan, but is larger and heavier. It is also less attenuated at the base, while its lateral edges are characteristically convexly curved. Moreover, the hexameral arrangement of the septa observed in *P. deltoideus* is evidently wanting in *P. magnus*.

Genus Platytrochus.

Platytrochus Maudensis, *spec. nov.* Pl. xxii., figs. 6*a*, *b*.

Corallum minute, free, and much compressed, especially inferiorly. The lateral edges of the faces descend vertically for rather more than halfway from the summit, when they curve towards each other and meet in a roundly pointed base. The upper part of the corallum thus forms a rectangle and the lower a triangle, with the base as its apex. A white, shining epitheca covers the whole surface. Beneath it the costæ, which correspond with the septa, usually, but not always, show as broad, flat bands, with narrow interspaces; in the figured example they are exceptionally well marked for a short distance from the summit.

The calice is arched and higher centrally than at the wall. It is elliptical with the two axes in the ratio of 10 to 6. The septa curve upwards from the wall to their central terminations. They are granular, equal, and in six systems with three cycles. In the extreme lateral systems the tertiaries curve towards the primaries, and join them close to the columella; in the other systems this union is rarely seen. The secondary septa are always free. The columella is strong, nodular, and occupies a considerable space in the calice. In the type it consists mainly of three projecting nodules fused together by solid tissue; in other examples its outline is irregular and differs in every individual. There is, however, always a central linear portion which is joined by processes from the septal ends. One specimen, cut transversely a short distance below the upper surface of the calice, is solid centrally, the columella being completely fused with the axial margins of the septa.

Height of corallum, 4·5 mm.; length of calice, 2·5 mm.; breadth of do., 1·5 mm. The specimens are uniform in size.

Locality, etc.—Fairly common in the lower beds at Maude, on the Moorabool River (seven examples). These beds are usually classed as Eocene.

The corallum of this small species looks much like a worn *P. hastatus* with the spear-like base removed. Its calice, however, is nearer that of *P. curvatus.* The papilli of the columella, which characterise the genus Platytrochus, are, I think, in the Maude coral soldered into groups by secondary infilling.

Genus Ceratotrochus.

Ceratotrochus Australiensis, *Duncan* (var.). Pl. xxii., figs. 5*a*, *b*.

Conotrochus typus, Seguenza, var. Australiensis, *Duncan*, Q.J.G.S., vol. xxvi., pp. 298, 9. Pl. xix., fig. 8.

This coral, which is very common in the Australian tertiaries, differs in several respects from that described by Se-

guenza,* and subsequently by Reuss.† Its septa are less regularly disposed and the papilli of the columella are much less numerous. For *C. typus*, Seguenza gives 30 to 40 and Reuss 28 to 36 as the number of the papilli, whereas the Australian form contains from 6 to 12 only. Another distinction is that the latter has sometimes a considerable amount of endotheca in the calice, while no mention is made by either Seguenza or Reuss of endothcea in the European examples. Amongst my specimens there are three which show a notable amount of endotheca. In Duncan's figure the artist has clearly indicated some endotheca, and in the accompanying plates I give a drawing of a calice from Fyan's Ford with more still. For these reasons I propose to make Duncan's varietal name of the Australian form a specific one.

Locality, etc.—Eocene. West of Gellibrand River, (Duncan's type locality), Cape Otway, Shelford, and Fyan's Ford, Moorabool River. The figured example is from Fyan's Ford, and its pedicel has been broken off.

GENUS DISCOTROCHUS.

Discotrochus ? pateriformis, *spec. nov* Pl. xxii., figs. 7*a*, *b*.

The corallum is free, discoid, and very small. In shape it resembles a miniature dish, with an outwardly sloping perimeter. The base is flat, elliptical, smaller than the calice, and without trace of adherence. The costæ are broad, subequal, almost plain, roundly projecting, and continuous with the septa. Most of them reach the base, and are separated by interspaces equalling them in breadth, and having a very fine longitudinal ridge in the centre of each. The wall is stout and well marked at the calicular margin. Both the base and sides of the corallum have a white, glistening appearance.

The calice is subplane and elliptical, its major and minor axes being in the ratio of 4 to 3. The septa are exsert, stout, nearly equal in size, and closely beset on their sides with large, pointed granules. They are in six unequal systems with four cycles, of which the last is developed only in two and a half systems. The quaternaries, when present, are very short, and fuse with the tertiaries quite close to the wall. Occasionally also the tertiaries join the enclosed secondary at their inner ends. The columella is prominent, fascicular, and occupies considerable space in the calice.

* Disqu. Pal. intorno ai Corall. Foss., Torino. Part II., pp. 83-5, pl. x., fig. 1.

† Foss. Korall. Osterreichisch-Ungarischen Miocäns, Wien., p. 30, pl. iii., figs. 10-12.

Height, 2 mm.; length of calice, 4 mm.; breadth of calice, 3 mm. The base is 2 mm. long and 1·5 mm. broad.

Locality, etc.—The only example of this small coral was collected in the upper Eocene at Spring Creek by Mr. A. E. Kitson. Until other specimens come to hand, its generic position is queried. In several respects it closely resembles *Discotrochus Duncani*, Reuss, from the Miocene of Austro-Hungary.* Its septa and costæ are arranged on the same plan even to the fine ridges in the intercostal furrows. It also agrees in size, though it differs slightly in shape.

Genus Trochocyathus.

Trochocyathus Wilkinsoni, *spec. nov.* Pl. xxiii., figs. 4*a*, *b*.

The corallum is turbinate, slightly curved, and expands regularly from the short, contracted, pedicellate base to a widely open calice. The costæ are continuations of the septa, and consist of subequal, prominent, granulate ridges, which are separated by corresponding interspaces. An epitheca, very delicate superiorly, but gradually becoming denser towards the base, covers both the costæ and their interspaces. The wall is stout, especially inferiorly.

The calice is shallow and slightly elliptical, with its major and minor axes in the ratio of 100 to 82. The septa are in six systems with five cycles. Their margins and sides are beset with sharply pointed granules. The primaries and secondaries are moderately stout and subequal; the remaining orders diminish gradually in size. The quaternaries in each system unite with the enclosed tertiary, either on the surface or just below it, and from a half to two-thirds from the wall. The quinaries are rarely developed in both halves of the systems, and may be entirely absent in a whole system; when present, they fuse with the enclosed quaternary at about one-fourth from the wall. The pali are in two crowns, elongate, granular, irregular in shape, and placed before the first three orders of septa, the tertiary pali being much larger than the rest. The columella is fascicular, with a papillary surface, and fills the central fossa. The papilli present a confused appearance, and are not easily separable from the smaller, more central pali. The calice of this species much resembles that of *T. Victoriæ*, Duncan, but has an additional cycle of septa in some systems and a larger columella. The pali are similar in appearance, and in both species are really enlargements of the septal ends. Such corals are by authors generally placed in Trochocyathus.

* Op. cit., p. 29, pl. iii., fig. 13, and pl. iv., figs. 1, 2.

The specimen illustrated has its columella area partly choked. The calice of another and larger example, though broken down at its margin, is clearer, and the description given is derived principally from it.

Height, 10 mm.; diameters of calice, 11 mm. and 9 mm. The larger example mentioned, though slightly reduced by wear, is still 14 mm. high.

Locality, etc.—Rare in the Eocene outcrop just below Rivernook House, Princetown. I name the species after the late Mr. Wilkinson, who discovered the section, and noted it as No. 7 on his map of the Cape Otway coast (1865).

Genus Leptocyathus.

Leptocyathus ? convexus, *spec. nov.* Pl. xxiii., figs. 3*a*, *b*.

The corallum is free, of compact appearance, almost crown-shaped, but longer than broad, and slightly compressed inferiorly. The base is flat, elliptical, and without trace of adherence.

The costæ are subequal, finely serrate on their edges, separated by narrow grooves, and in six systems with four cycles, of which the last is complete in two systems only, each of the remainder having this undeveloped in one half-system. From the base to the middle of the wall they are very broad, and then diminish gradually as they ascend. For about three-fourths of the circumference of the corallum all the costæ reach the base, but on one side the higher orders exceptionally join the tertiaries midway on the wall.

The calice is convex and elliptical, with its axes in the ratio of 100 to 86. The septa are highly exsert, and in reality merely arched continuations of the costæ, without defined boundary. Like the latter, they have dentate edges, but their sides are more strongly granular. They taper off towards the centre of the calice, and present the same arrangement of cycles and systems as the costæ. The principal septa are unequal, and the higher orders shorter and usually thinner; the latter are free superiorly, but fuse with the tertiaries just below the surface. The central fossa is small, excavated, and approximately circular. Its contour in the type calice is rendered somewhat irregular by an accidental fracture of some septa in two of the systems. It contains a number of small papilli soldered inferiorly to each other. Some of these represent the columella, while the outermost of them are probably the pali. In another very young specimen there are six elongated pali and a small nodular columella. There is no epitheca, and the wall is apparently formed by the costæ, which ultimately fuse together on the base.

The corallum is 4·5 mm. high, 5·25 mm. long, and 4·5 mm. broad.

In Edwards & Haime's description of *Leptocyathus elegans* from the London clay, very thin pali, placed before all septa, and a delicate papillary columella are mentioned.* Duncan's L. epithecata, which is described as an aberrant form of the genus, shows small broken-granular pali merging into a central columella, and only the larger septa have pali.† Pourtales refers a recent coral, *L. Stimpsoni*, to the genus with some doubt, and states that there are distinct pali before the secondary septa, while those before the other orders are scarcely distinguishable from the columella processes.‡ Lindström deals with the same species, but queries the genus. He says there are no pali and that the papilli of the columella may sometimes be mistaken for pali.¶ He also describes the recent *L.? halianthus* as having a similar papillose columella, which in part simulates pali.‖ Lindström's drawing of *L.? Stimpsoni* has somewhat the appearance of *L.? convexus.* The Australian coral has certainly the habit of Leptocyathus, as understood by the authors last mentioned, and may be provisionally referred to that genus.

Locality, etc.—In the Spring Creek section. Only two examples have been found, viz., those mentioned above. Collected by Mr. A. E. Kitson and myself.

Genus Deltocyathus.

Deltocyathus stellaris, *spec. nov.* Pl. xxiii., figs. 1*a*, *b*, *c*.

The corallum is free, discoid, and resembles in general form a plano-convex lens. Its under surface is horizontal, with a scarcely perceptible prominence in the centre, and without showing a trace of adherence. The costæ are in six systems with four cycles, which are nearly equally developed, and conspicuously radiate on the base. The three principal orders commence at the centre, and the fourth close to it as coarse, granulated lines, which then gradually become broader as well as higher towards the margin. Their interspaces similarly increase in width towards the edge, which is rendered regularly serrate by the equal projections of the costæ.

The calice is circular, almost flat, with a moderately large and shallow fossula. The columella is distinct, nodular on its upper surface, and fascicular beneath. The septa are

* Brit. Foss. Cor., pp. 21-2, t. iii., fig. 6.
† Foss. Corals of Sind., pp. 60-1, pl. iv., figs. 4-7.
‡ Deep Sea Corals, p. 12, pl. iii, figs. 1, 2, 3.
¶ Actinology of Atl. Ocean, p. 9, pl. i., figs. 5 to 8.
‖ Op. cit., pp. 9, 10, pl. i., fig. 9.

direct continuations of the costæ, the only visible boundary between them being the under surface of the corallum. They are in six equally developed systems, with four cycles, and show the delta-like combinations characteristic of the genus. In the several deltas, large, stout, and much raised pali are placed before the union of the short quaternaries with the tertiaries, a deep notch in all three septa marking the point of junction. At its outer end each palus consists of three separate processes, of which the central one is longer, higher, and more arched than the others. The solid portions of these pali taper somewhat, converge in each system, and then unite laterally with the enclosed secondary septum. The other pali reach the columella and are much smaller, especially the primaries, which are slender, much like the septa themselves, and united to them by thin, sunken processes; the secondaries are irregular in shape, more central than the tertiaries, and less conspicuous in the calice. All the septa and pali are similarly covered on their sides by closely set rows of stout granules.

Diameter, 10 mm.; maximum height (to summit of pali), 3 mm.

Locality, etc.—Rare in the Spring Creek section; five examples.

This species is at once distinguished from other Deltocyathi of the Australian tertiaries by its flattened outline, coarsely granulated costæ, and large tertiary pali.

Deltocyathus fontinalis, *spec. nov.* Pl. xxiii., figs. 5*a*, *b*.

The coralla are generally discoid in outline, rarely shortly cylindrical. They vary also in size. The base has a rounded margin, and may be flat, barely convex, or hollowed out centrally. A scar of former attachment is occasionally present. The costæ are finely granular, radiate on the base, and perpendicular, or nearly so, from the basal margin to the border of the calice, when they again curve round, and are continued as septa. They are equal, broad, and in six systems with four cycles. In examples with no basal scar the primaries and secondaries are traceable to the centre; the quaternaries fuse together near the centre and enclose the shorter tertiaries. The wall is thin, low, deeply seated, and rarely visible in the narrow interspaces of the costæ.

The calice is circular, slightly convex, or almost flat, with a shallow central fossa. The septa are unequal in length, stout, and very granular. The pali are also granular, and are placed before the first three orders of septa. Those before the tertiary septa are the largest and converge towards

the secondary pali, which, like the primary, adjoin the columella. There is a distinct, papillary columella.

The figured corallum is from Spring Creek, and its dimensions are:—Height, 3 mm.; diameter of calice, 6·5 mm. Another from the same locality is 4 mm. high, and its calice is 7 mm. in diameter. An example from Table Cape is 8.5 mm., and one from Beaumaris 9 mm. in diameter: both of these are reduced in height by wear. The largest example is from Forsyth's, Grange Burn, and is 5·5 mm. high, and 9 mm. in diameter.

Locality, etc.—Extremely common at Spring Creek and Maude; less so at Table Cape, Beaumaris, and the upper beds of Muddy Creek. Rare in the Mulgundawa bore, near Wellington, South Australia. Its range is, therefore, from Eocene to Miocene.

The specimens from Spring Creek show no trace of adherence, and the base is flat: in those from Beaumaris, Table Cape, and the Muddy Creek Miocene the base is variable, being either flat or convex, and with or without a scar of attachment. The base is usually concave in Maude examples, and seldom shows any central scar. Though somewhat diverse in size, as well as in the outline of the base, the fossil forms agree in essential characters. As already intimated in this volume, they are closely allied to the recent *D. Vincentinus*, mihi. The latter, however, is generally taller and larger, is without tertiary pali, and has a deeper central fossa. Examples of the fossil species from Table Cape, Beaumaris, and Muddy Creek are apparently nearer the recent one than those from Spring Creek and Maude.

Deltocyathus Verconis, *spec. nov.* Pl. xxiv., figs. 2*a*, *b*.

The corallum is minute and discoid in shape. The base is flat with a rounded margin. At its centre there is a scar of former attachment, large for the size of the coral, and either circular or elliptical. There are 48 radiating costæ on the base, of equal size, free, and nearly as stout at their central ends as at the margin. They do not arise from the centre of the base, but only from the borders of the scar of adherence; when this is removed by wearing, as is often the case, the under surface of the columella and of the inner ends of the principal septa are exposed. The surface of the costæ is crenately granulose, the separate granules being large, rounded in the axial line, and bluntly projecting transversely. From the basal margin the costæ rise vertically for a short distance, and then, curving round, are continued as septa.

The calice is circular and only slightly convex. The septa are stout, sub-equal, profusely granular, and, though now mostly flattened by wearing, were originally exsert. They are in six systems with four cycles, and are arranged in the usual deltoid combinations. There are pali before the principal orders, those before the secondaries being the largest. The columella is fascicular and fused with the primary and secondary pali.

Height of corallum, 2·5 mm.: diameter of base, 4·5 mm. There are three coralla of this size in my collection, and the rest are smaller.

Locality, etc.—In Eocene strata at Shelford (amphitheatre section), ten examples; and in the equivalent bed on the Murray River, near Morgan, one example.

I have great pleasure in naming this species after Dr. Jos. C. Verco, whose extensive dredging operations in St. Vincent and Spencer Gulfs have so materially increased our knowledge of the marine fauna of South Australia.

FAMILY OCULINIDÆ.

Genus Oculina.

Oculina umbellata, *spec. nov.* Pl. xxv., fig. 3.

The corallum is composite, compact, and umbel-shaped, with a flat upper surface and rapidly sloping sides. The base is stem-like, and now shows a fractured under surface without visible sign of adherence. Seven large calices are regularly arranged around the upper marign, with their outlines showing also on the sides as mammillated projections. They are unequal in size, irregularly elliptical, and of moderate depth. The costæ rise slightly above the margin of the calices, are continuous with the septa, equal, broad, granulose, and distinct on the upper surface, especially at the calicular margins. From these they recede in curved, tortuous lines, and gradually become less prominent; on the sides of the corallum the costæ are very faintly marked.

The calices are, unfortunately, broken down internally, as if they had been cleared of sediment with a sharp instrument, and their structure cannot therefore be fully determined. There are numerous, close, granular septa, but the number of systems and cycles is not now decipherable. Remnants of granular pali and of a nodular columella are still left in one or two calices. Judging from the well preserved state of the costæ, this unique specimen must have been originally in excellent order.

At its summit the corallum is 35 mm. long and 30 mm. broad. The solid cœnenchyma from the extremity of the base to the centre of the upper surface measures 21 mm.

The diameters of the largest calice are 13 mm. and 10 mm.; and of the smallest, 9 mm. and 8 mm. respectively.

Locality, etc.—From a well-sinking in the Murray Desert. The coral was sent to the late Professor Tate, who, after some trouble, identified the locality as Mindarie, 80 miles south-east of Swan Reach, Murray River. The age of the fossils accompanying it is given in Professor Tate's memoir as Post-Eocene (? Oligocene).*

FAMILY ASTRÆIDÆ.

Genus Parasmilia.

Parasmilia Flindersensis, *spec. nov.* Pl. xxiii., figs. 2*a*, *b*.

The corallum is pedicellate, tapering, and curved or twisted. Some examples have occasional warts or excrescences on their surface. The wall is stout and smooth, and rarely shows the remains of a banded epitheca: at the summit only a few costæ appear as continuations of the principal septa. A specimen lately collected has the base of one corallum attached to the calice of another, with its columella and half the septa still free. This, however, is merely a case of accidental adhesion.

The calice is circular and deeply excavated. The columella is large, spongy, and reaches high up in the calice. The septa are sparsely granular, and in ten systems, with three cycles. The primaries are long, stout, and wavy; for a short distance from the margin they are horizontal, and then descend vertically in the fossa, a clear space being left between them and the columella. The secondaries are thinner, less conspicuous, also wavy, and pass into the fossa nearer the margin; the tertiaries are very slender lamellæ. Endotheca scanty; in the type specimen there is apparently none, but it is certainly present in some others.

Height, 14 mm.; diameter of calice, 6 mm.

Locality, etc.—In a small exposure of Eocene limestone at Flinders, Victoria.

Parasmilia lucens, *spec. nov.* Pl. xxiv., figs. 6*a*, *b*, *c*.

The coralla vary both in shape and size. Some are straight and conico-cylindrical, or vase shaped, while others are slightly bent and of nearly the same circumference throughout. Again, there are moderately tall as well as short examples. The pedicellate base is large and is frequently still attached to a fragment of shell. The wall is stout, and is covered by a white, shining epitheca, which

* On some Older Tertiary Fossils of uncertain age from the Murray Desert. R.S.S.A., vol. xxiii.

occasionally has a few warty excrescences on its surface. The costæ are broad, more or less granular, and faintly marked beneath the epitheca. When this is worn off the granules of the costæ become more distinct.

The calice is circular and shallow. The septa are highly granular, and in six systems with four cycles. They are slender, but unequal in size, the two first orders being stouter than the very thin tertiaries and quaternaries. The columella is moderately large, fascicular, and united by lateral processes with the inner ends of the principal septa. A scanty endotheca is present in some of the calices.

The wall of the larger corallum figured has been broken down below the level of the columella, which now projects above it. The total height of the specimen is 20 mm. A smaller bent individual is also somewhat damaged. It is 15 mm. in height, with a calice 7·5 mm. in diameter.

Locality, etc.—In Eocene strata at Brown's Creek, in the Aire River district. Ten examples.

This species differs from *P. Hermani* of the same beds by its large base, and straight or slightly bent instead of horn-shaped corallum. It is distinguished also by its smooth, shining epitheca.

Genus Conosmilia.

Conosmilia granulata, *spec nov.* Pl. xxiv., figs. *5a, b.*

The corallum is curved, horn shaped, circular in transverse sections, inflated superiorly, and then tapering to an almost pointed base; at the extremity of this there is a mark of former adherence. A delicate, finely granular epitheca covers the wall, which is thin in the figured example, but stouter and stronger in a larger one. The latter has a portion of the wall at the calicular margin and some of its septa broken down, while the type is a finely preserved specimen. The costæ are continuous with the septa, equal, slightly projecting at the summit, and prominent or not lower down. They are outlined on the wall by broad, wavy lines of the epithecal granules.

The calice is circular, widely open, and shallow. The septa are granular, slender, and in six systems with four complete cycles. The primaries and secondaries are long, and reach the columella; the tertiaries are slightly and the quaternaries much shorter. The latter are also somewhat thinner than the other orders. The columella is prominent, trabecular, and formed of twisted, vertically placed laminæ, which fuse with the inner ends of the primary and secondary septa The endotheca is scanty.

The dimensions of the type are:—Height of corallum, 17 mm.; diameter of calice, 10 mm. The larger example men-

tioned is 30 mm. in height, and its calice is approximately 15 mm. in diameter.

Locality, etc.—In Eocene strata at Cape Otway. Two examples. A single juvenile example also from Brown's Creek. Collected by Mr. Kitson and myself.

I place this species in Conosmilia on account of its twisted laminate columella. In all other respects it might certainly come under the allied genus, Parasmilia.

Conosmilia stylifera, *spec. nov.* Pl. xxiv., figs. 1*a*, *b*.

The corallum is small, cylindro-conical in shape, of moderate height, or sometimes tall, usually straight, but occasionally curved just above the pedicellate base. The wall is thin near the calice, but becomes stouter below, and is covered by a pellicular epitheca. This is ridged transversely, but otherwise almost plain. With the lens, however, very fine encircling lines and broad longitudinal striæ are traceable on its surface. These striæ mark the mural boundaries of the septa, and thus represent very faint, rudimentary costæ.

The calice is circular and deep centrally. The septa are in six systems and three complete cycles, with occasionally some of a fourth. The primaries, which are stout and long, slope from the margin, and then descend almost vertically in the fossa. For some distance down a clear space is left between them and the columella, but lower still they become fused with it. The remaining orders of septa are much thinner, subequal in size, and of diminishing length according to order. The inner edges of all the septa are more or less waved, and their sides are sparingly granular. The columella is strong, and projects vertically in the fossa as a long pointed style. It is nodular, twisted, broad below, and gradually tapers upwards. Deep down in the fossa it sends out strong lateral processes, which fuse with the primary septa. The endotheca is fairly developed in some examples, but in others is very scanty.

The coralla vary in height from 10 mm. to 17 mm.; the calices are from 4 mm. to 5 mm. in diameter.

Locality, etc.—In Upper Eocene strata at Spring Creek. Eleven examples.

This species is at once distinguished from all other Conosmiliæ by its strong styliform columella and almost plain epitheca.

FAMILY FUNGIDÆ.

Genus Bathyactis.

Bathyactis Beaumariensis, *spec. nov.* Pl. xxiv., figs. 3*a*, *b*.

The corallum is very small, discoid, and free. The base is either flat or slightly concave, and, with the exception of a

narrow rim, is covered with a white, glistening epitheca. The surface is smooth, but lightly raised here and there in small, blister-like swellings. The costæ are stout and prominent on the basal margin of many examples, but in others the edges are merely crenulated by their equal projections. Except at the rim the costæ are usually concealed on the base by the epitheca, but occasionally they are faintly traceable beneath it, and in a single example show as well raised lines almost to the centre. At the margin they rise vertically to the height of the corallum, and then, bending sharply round, continue in the calice as septa. On the basal rim as well as on the perimeter of the corallum they are rounded, very finely dentate at their free edges, and beset laterally by numerous sharply pointed granules.

The calice is circular and flat. There are four cycles of septa and six systems, of which one is often incomplete. The primaries are free, and the remaining orders unite together in deltoid combinations. In a complete system each pair of quaternaries unites with the enclosed tertiary to form single septa of increased size. These, converging towards each other, meet in front of the straight secondary, and fuse with it. A short, stout septum is thus produced, which reaches the columella. In the type calice one system is incomplete, half of it being undeveloped. All the septa are more or less flattened at the surface, and are minutely granular on their sides. The columella is essential, of moderate size, and trabecular. It fuses with the edges of the primary and secondary septa. The margins of the septa are markedly coalescent over the apices of the deltas. The synapticulæ are few, and in many specimens scarcely noticeable. In the figured specimen they are arranged in a concentric circle at about one-fourth from the margin.

The coralla are from 3·5 mm. to 4 mm. in diameter, and from 1 mm. to 1·5 mm. in height.

Locality, etc.—Abundant in the Miocene of the Grange Burn (upper Muddy Creek beds), and in the Oligocene of Beaumaris. The type is from the latter locality.

Bathyactis excelsa, *spec. nov.* Pl. xxiv., figs. 4*a*, *b*.

The corallum is discoid and lens-shaped. Its base is slightly concave or almost flat, and without trace of attachment. The costæ are broad, equal, and continuous with the septa. They dentate the edge of the base by their projections and remain prominent on its surface for a short distance inwards, when they suddenly become much less distinct. Their surface and also the intercostal spaces are covered with a fine granular epitheca.

The calice is circular and convex. The septa are stout, subequal, and in six systems with four cycles, the last three of which form the deltoid combinations usual in the genus. The primaries are free, the tertiaries bend towards and join the secondaries at a fourth from the columella, and the quaternaries again join the tertiaries about halfway from the margin. At their junction with the next higher orders of septa both the tertiaries and secondaries become slightly thicker than before, and rise in the calice as rounded, lamellar, fan-like projections. The raised secondary fans descend vertically in the axial space until they reach the level of the sunken primary septa, when, similarly with these, they unite by thin processes with the columella. The sides of the septa are characteristically marked by inwardly converging rows of sharp, prominent ribs, which project beyond the free septal edges, and strongly dentate them. Sometimes these ribs consist of intermittent lines, and then resemble rows of sharply pointed granules. The columella is strong, lamellar, dentate on its free edge, and in line with two opposite primary septa. There are usually three dentations on its surface, of which the central one rises above the other two.

The synapticulæ are numerous, stout, in four or five concentric lines, and placed between all adjoining septa.

The figured specimen, which is the largest collected, is 13 mm. in diameter. Its height to the summit of the secondary and tertiary fans is 5 mm. The other examples are about 10 mm. in diameter.

Locality, etc.—Fairly common in Eocene strata at Spring Creek, near Geelong. Rare at Fishing Point, Aire River.

This coral is closely allied to *Bathyactis lens*, Duncan,* from which it differs by its larger size, more numerous synapticulæ, and stout lamellar columella. In his original description of *B. (Antillia) lens* Duncan gives it a small essential columella, but when dealing with the same coral under the name of *Montlivaltia discus* Woods states that it is without a columella. I have examined numerous examples of Duncan's and Woods's species, and judge that it has a minute, almost styliform, columella.

FAMILY EUPSAMMIDÆ.

Genus Balanophyllia.

Balanophyllia truncata, *spec nov.* Pl. xxv., figs. 4*a*, *b*.

The corallum is simple, short, stout, sub-cylindrical, and abruptly terminated superiorly. The base is broad, flat,

* *Antillia lens*, Duncan. Ann. and Mag. Nat. Hist., 1865. *Montlivaltia discus*, Ten.-Woods. R.S.N.S.W., 1878. *Bathyactis lens*, Dennant. R.S.N.S.W., 1897.

tumid, and usually attached to a fragment of shell or to polyzoa. One example has its base perforated for an annelid, the calcareous tube of which is still left almost intact on its under surface. The wall is stout, and marked by rows of broad, prominent, equal, granular costæ. At the truncated summit of the corallum these festoon the calicular margin, and contrast strongly with the slender septa which form their continuations in the calice. There is a variable amount of epitheca, and it may be either delicate or moderately stout. When worn away, as is frequently the case, a series of irregular, longitudinal pores, separated by thin, transverse bars, become visible in the interspaces of the costæ.

The calice is subplane and slightly elliptical. The ratio of the major and minor axes varies in the examples; in the type it is as 10 to 8. The septa are porous, very thin, minutely granular, and in six systems with four cycles. The tertiaries are the most conspicuous septa in the calice and the two in each system bend towards each other and unite close to the columella. Not unusually these septa describe a double curve, first towards the tertiary of the same system, and then away from it towards the adjoining one in the next system. The quaternaries bend towards and join the tertiaries near the margin; in the loops thus formed the free quinaries appear as very short projections from the wall. The primaries and secondaries are free, subequal, and continue or not to the columella. In the type calice only one system is complete, the rest wanting the two higher orders in one half of each system. A slightly larger but less perfect calice has the higher orders more fully developed. The columella is prominent, fascicular rather than spongy, and longitudinally placed in the fossa.

Height, 14 mm. Length of calice, 5·5 mm.; breadth of do., 4·5 mm.

Locality, etc.—Eocene. Abundant at Spring Creek, and fairly common at Cape Otway, Wilkinson's No. 4, and Fishing Point. Single examples from the clays of Calder River, a tributary of the Aire, and from Shelford.

Balanophyllia induta, *spec. nov.* Pl. xxv., figs. 1*a*, *b*.

The corallum is tall, slender, straight or slightly bent, and either subcylindrical or regularly tapering. The base is flat and pedicellate. The pedicel is of moderate size, and sometimes quite small. The wall is stout, and covered by a thin pellicular epitheca. This is marked transversely with fine chevroned lines arranged in a series of narrow, scarcely raised, encircling bands. Such an ornament is unusual in Balanophylliæ, and resembles that seen in some species of Fla-

bellum. The specimens are often much worn, and the epitheca then becomes almost or quite smooth. The costæ are very faintly marked as parallel lines beneath the epitheca.

The calice is shallow and either circular or just elliptical. The septa are slender, minutely porous, and sparingly granular. They are in six systems with four cycles, which are arranged on the same plan as those of the species just described. The calice illustrated belongs to the tallest example collected, and has only two of its systems complete; in two others the higher orders are partially developed, while in the remaining two they are wholly wanting. The columella is moderate in size, spongy, and longitudinally placed.

Diameters of calice, 7 mm. and 6·5 mm. Height of corallum figured, 17 mm. The tall individual mentioned has a height of 25 mm., but though its calice is well preserved, the epitheca is much worn, and in places entirely removed, the porous wall beneath being thus exposed.

Locality, etc.—Eocene. Spring Creek, near Geelong, 13 examples; Cape Otway, 2 examples; Wilkinson's No. 4, 1 example. Those from the two last mentioned localities and one from Spring Creek are much smaller than the rest.

This species is distinguished from the preceding by its complete epitheca. It is also of more slender habit.

Balanophyllia fossata, *spec. nov.* Pl. xxv., figs. 2*a*, *b*.

The corallum is moderately long, curved, conico-cylindrical, and regularly tapering to a small pedicellate base. The wall is porous, granular, and stout. It is encircled by a partial epitheca, which is banded and occasionally raised in growth ridges. Towards the base the epitheca is stronger and more persistent than in the superior portions of the corallum. The costæ are either faintly marked, or, as in the type, barely traceable on the wall.

The calice is slightly elliptical, very deep, and has a broad margin. At the bottom of the central fossa, which in the well preserved calice figured is narrow as well as deep, a small, delicate, spongy, and longitudinally placed columella is just perceptible. The septa are minutely granular, and in six systems with four cycles. All are slender, but the primaries, secondaries, and also the tertiaries below their junction with the higher orders are rather stouter than the rest. The higher orders are absent in one half-system of the type calice, but are otherwise regularly developed. They slope rapidly downwards, and, bending towards the tertiaries, join them at about one-third from the margin. Below this junction the tertiaries increase in size, and, passing beyond the first two orders, descend abruptly in the fossa.

There is no other union of septa in the calice, the primaries and secondaries being straight and free. The edges of both these orders slope gradually for a short distance from the wall, and then, like the tertiaries, they descend vertically in the fossa. They do so, however, much nearer the margin, and thus at a comparatively high level in the calice.

Height of corallum, 21 mm.; length of calice, 10·5 mm.; breadth of do., 9 mm.

Locality, etc.—Very rare in the Eocene strata of Cape Otway. Two examples.

This species is allied to *B. tubuliformis*, Duncan, from which it is distinguished by its banded epitheca, slender septa, elliptical calice, and curved outline.

Balanophyllia patula, *spec. nov.* Pl. xxv., figs. 6*a*, *b*.

The corallum is straight, subturbinate, slightly compressed, moderately tall, broad at the summit, and then tapering to a tumid pedicellate base. The whole surface is vermiculate and granular, the granules being most prominent on the broad, equal, raised costæ. These project at the summit, and slightly overlap the calicular margin, where their correspondence with the septa is well marked. The wall is highly porous, and so thin as to appear translucent when viewed against the light. There is no epitheca.

The calice has a vermiculate margin, is shallow, widely open, and subelliptical. The septa are slender, porous, granular, and occasionally spined. They are in six systems, with four complete cycles. The tertiaries are by far the most conspicuous septa in the calice. For about one-half from the wall they are small and thin, when they are joined by the higher orders, which curve towards them. At this junction, or a little above it, they rise as large, stoutish, very prominent fans, with spined and jagged edges, and continue to the columella. There are thus twelve tertiary fans in the calice, of which the eight opposite the sides are larger than the four at the ends. The two fan-like tertiary septa in each system curve round at their inner ends and unite in front of the enclosed straight secondary, which, though usually free, sometimes continues to the apex of the curve.

The primaries are straight, free, and reach the columella. This is spongy, of moderate size, and placed in line with the major axis of the calice.

Some endotheca occurs between septa, chiefly near the margin and at the columella.

Height, 23 mm. Diameters of calice, 14 mm. and 12 mm.

Locality, etc.—This elegant coral is represented in my collection by a single, perfect specimen, which was found in

the Eocene exposure at Red Bluff, Shelford. It is distinguished from other Australian Balanophylliæ by its widely open calice, prominent and equal costæ, as well as by the raised fan-like extensions of the tertiary septa.

Balanophyllia torta, *spec. nov.* Pl xxv., figs. 5*a*, *b*.

The corallum is free, cylindro-conical, curved, and twisted. It tapers gradually at first, and then more rapidly to the base, which terminates in a bluntly rounded point. There is no trace of adherence. Strictly speaking, therefore, it might be placed under Eupsammia, but as it has the habit of Balanophyllia I retain it in that genus.

The wall is cellular, thin at the calicular margin, but stouter below. An epitheca of delicate texture covers it here and there in irregular bands or patches. The costæ are broad, equal, granular, and traceable on the wall from the summit to the base of the corallum. Where the epitheca is wanting they consist of raised, prominent ridges.

The calice is deep, slightly elliptical, and has an irregular, cellular margin. In the example figured it is contracted on one side by an inbending and consequent overlapping of the wall. The septa are moderately stout, porous, highly granular, and in six systems with four cycles. The primaries are straight and free; the secondaries are either free or join one of the tertiaries near the columella. The tertiaries are very prominent, are joined by the higher orders at about one-fourth from the wall, and then continue to the columella. Above this junction they form with the quaternaries a series of twelve intra-mural loops, with a small, straight quinary in the centre of each.

The columella is of moderate size, spongy, long, and at the bottom of the deep, central fossa. As the wall surrounding the calice is very thin, it is frequently broken down even below the level of the columella, which then projects in the calice, instead of, as in perfect specimens, just showing at the base of the fossa. It is easy to understand that a specific determination based on such worn material might be altogether erroneous.

Height of corallum, 25 mm.; length of calice, 11 mm.; breadth of calice, 9 mm. A taller specimen has a height of 31 mm., but its wall is broken down in the manner described. Originally it must have been at least 36 mm. in height.

Locality, etc.—In Eocene strata at Cape Otway and Wilkinson's No. 4 locality. Four large examples and seven smaller ones.

The only species likely to be mistaken for *B. torta* is *B. Ulrichi*, Duncan, which is very abundant in the same beds.

The latter can, however, be at once distinguished by the small pedicel at the end of the narrow base.

When dealing with the Australian Balanophylliæ, Duncan identified a species found at Cape Otway with *B. cylindrica*, Michelotti, from Turin and Verona.* In 1895 I entrusted the late Professor Tate, who was visiting Europe, with selected examples from my collection of Australian tertiary Balanophylliæ, for comparison with Duncan's types. He identified all the examples except *B. cylindrica*, and marked my supposed equivalent as "very doubtful." In one respect only, viz., its pointed base, does *B. torta* agree with Duncan's figures and description of *B. cylindrica*, but its calice is quite dissimilar, being deep, and superficially contracted instead of shallow and widely open. Either Duncan obtained specimens which are not represented in my collection, or, what is far more likely, he had before him immature, broken specimens of *B. torta*, or of some species allied to it.

A figure and description of *Balanophyllia (Turbinolia) cylindrica*, Michel. are given by Michelin†, and in remarking upon the species he says:—"Cette espèce est remarquable par sa forme très allongée et cylindrique, ses lamelles et ses stries égales, et sa base presque toujours brisée, paraissant avoir été adhérente." This description is certainly not applicable to *B. torta*, while the figure accompanying it is unlike any Balanophyllia that I have seen from the Otway beds.

Balanophyllia cauliculata, *spec. nov.* Pl. xxv., figs. 8*a*, *b*.

The corallum is in outline a cylinder supported upon a long, narrow, and slightly oblique stem. It may be compared to a miniature wineglass with its foot removed. There is a small pedicel at the extremity of the stalk-like base. The wall is cellular and minutely granular. A dense, banded epitheca, with fine encircling lines, covers the stem, and a broad band of a finer textured epitheca surrounds a constriction of the wall just below the calicular margin. The costæ are equal, broad, and correspond with the septa; above the epithecal band near the summit of the corallum they are prominent and highly cellular, but below this they are only faintly traceable on the wall.

The calice is deep and subelliptical, its major and minor axes being in the ratio of 100 to 87. Its margin is narrow and very cellular. The septa are delicate, cellular, porous near the wall, and finely granular. They are in six systems with four cycles. The primaries and secondaries are

* Q.J.G.S. Vol. xxvi., p. 304, pl. xxi., fig. 7.
† Icon. Zooph. p. 38, pl. viii., fig. 15.

straight, free, and rather stouter than the rest. The tertiaries are thin, spined, and wavy at their free edges, and are joined by the higher orders, which have also irregular, spined edges, about midway from the wall. The interior of the calice, with its slender, cellular, and wavy septa, may be compared to an extremely fine lace pattern. The tertiaries in each system bend towards each other, and meet or not near the columella. In one half-system the fourth cycle of septa is wanting, and its tertiary remains straight and free almost to the columella, when it curves round and unites with the other tertiary in the same system. The columella is small, fascicular, and consists of a few twisted, rod-like processes, which are longitudinally placed at the bottom of the fossa. Superficially it is free, but deeper down it is joined by the principal septa.

The height of the corallum is 15 mm., the cylindrical portion being 9 mm., and the terminal stem 6 mm. in length. The calice is 8 mm. long and 7 mm. broad.

Locality, etc.—Very rare at Cape Otway and at Wilkinson's No. 4, adjoining beds in the Aire River district. One example from each locality.

This elegant little coral may be at once distinguished from its congeners in the same beds by its delicate, finely granular wall. Its nearest ally is *B. campanulata*, Duncan, which is also restricted to the beds mentioned. The latter, however, has a large, spongy columella, more prominent costæ, and much stouter septa.

Balanophyllia Basedowi, *spec. nov.* Pl. xxv., figs. 7*a*, *b*.

The corallum is very low, cylindrical, and attached by a broad, spreading base to shells or polyzoa. There is a distinct, perpendicular, stout, but very short wall. This is porous, and marked by broad, raised, granular costæ. Some epitheca exists; in the type it is confined to the outer portion of the spreading base.

The calice is circular, almost flat, and has a wide, porous margin. The septa are also porous, but not granular. They are in six systems with three cycles. The tertiaries curve round and join the secondaries about halfway from the margin, and these again unite with the primaries at the columella. The fourth order, when present, joins the primaries quite close to the wall. The columella is small, and consists of a few fascicular processes, which unite with the primary and secondary septa.

Height, 2 mm.; diameter of calice, 4·5 mm.

Locality, etc.—Eocene. The three examples of this coral are from widely separated localities. Two of them, viz., the type, from the Murray River, near Morgan, and another

from Spring Creek, are attached to polyzoa; while the third, from Cape Otway, is fixed to the tube of *Dentalium Mantelli.*

I dedicate this interesting coral to the late Hon. Friedrich Basedow, in remembrance of the great interest taken by him in the natural history of the State.

I have now dealt with nearly all the undescribed corals in my collection. The few remaining are represented by single and mostly imperfect examples, and their consideration must be postponed till fresh material comes to hand. Some general remarks upon the distribution, affinities, etc., of Australian tertiary corals will be made in a succeeding article, which is in course of preparation.

EXPLANATION OF PLATES.

Plate XXII.

Fig.
1. *Flabellum microscriptum*—corallum, natural size.
2. *Flabellum medioplicatum*—corallum, natural size.
3. *Flabellum Grangense*—corallum, magnified 1·5 diam.
4. *Placotrochus magnus*—*a*, corallum of deltoid example, natural size; *b*, corallum of cuneiform example, natural size; *c*, calice of the latter, magnified 1·5 diam.
5. *Ceratotrochus Australiensis*—*a*, corallum, magnified 2 diam.; *b*, calice of same, with endothecal ring, magnified 6 diam.
6. *Platytrochus Maudensis*—*a*, corallum, magnified 4 diam.; *b*, calice of another example, magnified 10 diam.
7. *Discotrochus ? pateriformis*—*a*, corallum, magnified 6 diam; *b*, calice of same, magnified 8 diam.

Plate XXIII.

1. *Deltocyathus stellaris*—*a*, corallum, magnified 3 diam.; *b*, calice of same, magnified 3 diam.; *c*, base of same, magnified 3 diam.
2. *Parasmilia Flindersensis*—*a*, corallum, magnified 2 diam.; *b*, calice of same, magnified 4 diam.
3. *Leptocyathus ? convexus*—*a*, corallum, magnified 4 diam.; *b*, calice of same, magnified 8 diam.
4. *Trochocyathus Wilkinsoni*—*a*, corallum, magnified 2 diam.; *b*, calice of the same, showing two systems of septa, magnified 6 diam.
5. *Deltocyathus fontinalis*—*a*, corallum magnified 4 diam.; *b*, calice of same, magnified 4 diam.

Plate XXIV.

1. *Conosmilia stylifera*—*a*, corallum, magnified 2 diam.; *b*, calice of same, magnified 5 diam.
2. *Deltocyathus Verconis*—*a*, calice, magnified 6 diam.; *b*, base of another example, magnified 6 diam.
3. *Bathyactis Beaumariensis*—*a*, calice, magnified 6 diam.; *b*, base of slightly smaller specimen, magnified 6 diam.
4. *Bathyactis excelsa*—*a*, corallum, magnified 1·5 diam.; *b*, calice of the same, magnified 2·5 diam.

5. *Conosmilia granulata*—*a*, corallum, magnified 2 diam.; *b*, calice of the same, magnified 3 diam.
6. *Parasmilia lucens*—*a*, a straight corallum, magnified 1·5 diam.; *b*, a bent corallum, magnified 1·5 diam.; *c*, calice of the latter, magnified 4 diam.

Plate XXV.

1. *Balanophyllia induta*—*a*, corallum, magnified 1·5 diam.; *b*, calice of a longer individual, magnified 4 diam.
2. *Balanophyllia fossata*—*a*, corallum, magnified 1·5 diam.; *b*, calice of the same, magnified 3·5 diam.
3. *Oculina umbellata*—corallum, natural size.
4. *Balanophyllia truncata*—*a*, corallum, magnified 1·5 diam.; *b*, calice of another example, magnified 6 diam.
5. *Balanophyllia torta*—*a*, corallum, natural size; *b*, calice of same, showing three systems of septa, magnified 3·5 diam.
6. *Balanophyllia patula*—*a*, corallum, natural size; *b*, calice of same, showing three systems of septa, magnified 3 diam.
7. *Balanophyllia Basedowi*—a, corallum fixed on a polyzoon, natural size; *b*, calice of same, magnified 6 diam.
8. *Balanophyllia cauliculata*—*a*, corallum magnified 2 diam.; *b*, portion of calice of same, magnified 6 diam.

Descriptions of Australian Curculionidæ, with Notes on Previously Described Species.

By Arthur M. Lea.

PART II.*

[Read October 27, 1903.]

SUB-FAMILY BRACHYDERIDES.

Evas elliptica, n. sp.

Densely clothed with small, round scales, entirely concealing the colour of the derm, those on the upper surface more or less metallic coppery; sides, from apex of rostrum, almost (or quite) to apex of elytra, and the under surface, with white scales, with a silvery (sometimes with a faint purplish or coppery) gloss; legs with scales as on upper surface, more or less mingled with white; base of femora with white scales. Eyes completely and narrowly ringed with white scales. In addition to the scales, clothed with stout, erect, white setæ; tibiæ fringed beneath with long, thin hair.

Head with a narrow, longitudinal impression between eyes. Rostrum transversely impressed on each side at base, with a feeble median carina. *Prothorax* (by measurement) slightly longer than wide, but apparently the reverse, sides gently rounded, apex very slightly narrower than base; with large, round, shallow punctures, distinctly traceable through clothing; without ocular lobes. *Elytra* elliptic-ovate, apex notched, at base no wider than prothorax, shoulders absent, widest at about one-third from base; seriate-punctate, punctures moderately large and subquadrate, moderately distinct through clothing; interstices not or scarcely visibly raised. All the *tibiæ* with small and acute teeth, but those of the posterior scarcely noticeable. Length $6\frac{1}{3}$, width $2\frac{1}{3}$ mm.

Hab.—W.A.: Darling Ranges.

The shape is very different to that of the other Western Australian species. The white scales at the sides of the elytra do not usually touch the extreme margins; the eyes have a spectacled appearance. On one specimen the prothoracic scales have a decided greenish gloss. The elytral setæ are placed in regular single rows: seen from in front or from above they appear decidedly white and in rather strong contrast to the scales; from the sides or behind they appear to be almost black, and are much less distinct.

* Part I. was published in Vol. xxiii., p. 137.

Evas latipennis, n. sp.

Densely clothed with small round scales, entirely concealing the colour of the derm; scales of upper surface more or less slaty brown, with a slight coppery gloss; sides, under surface, and legs with silvery-white scales; prothorax with two very distinct stripes of white scales, and which are feebly continued on to head and elytra; apex of elytra with white scales, and which are more or less feebly continued along interstices. Elytra with moderately stout, depressed setæ, visible from in front, above, or the sides, but invisible from behind; prothoracic setæ visible only from the sides.

Head wide, feebly longitudinally impressed between eyes. Rostrum short, shallowly longitudinally bisulcate. *Prothorax* subcylindrical; in male noticeably, in female scarcely, transverse; longitudinally impressed in middle; with small rounded granules; without ocular lobes. *Elytra* raised above and fully twice the width of prothorax, base on each side slightly oblique, shoulders subtuberculate; striate-punctate, punctures round and rather shallow, moderately distinct through clothing; interstices gently but distinctly convex and usually wider than punctures; apex feebly notched. Four anterior *tibiæ* with small and acute teeth. Length 8, width 3 mm.

Hab.—W.A.: Darling Ranges.

The elytra are proportionately wider and much more distinctly elevated above the prothorax than in the other species with which I am acquainted. The shoulders are slightly less square than in the male of *acuminata*. The brownish scales on the elytra cover less than half the surface, and are more distinct near the base, between the shoulders, and on the seventh interstice, than elsewhere; in one specimen the white scales are feebly tinged with pink.

Evas, sp.

I have a remarkable specimen of this genus belonging either to *acuminata* or to an undescribed species. It appears to be hermaphrodite, having the left side female and the right side male. The left elytron is rounded and not at all produced at the shoulder, being there scarcely wider than the prothorax; the right, on the contrary, having the shoulder produced and tuberculiform, and much wider than the prothorax; it is also wider throughout and fully half a millimetre longer than the other, and is more abundantly supplied with white scales. The right anterior tibia is slightly longer, more noticeably curved, and with slightly stronger teeth than the left.

EVADODES RUGICEPS, n. sp.

Densely clothed with muddy brown or grey scales, scarcely paler on flanks of prothorax and under surface than above. In addition with dingy whitish setæ.

Head longitudinally wrinkled between eyes; these small and very prominent. Rostrum with a very feeble carina along middle, depressed on each side; sides above scrobes almost parallel. *Prothorax* rather strongly transverse, disc somewhat uneven, with a narrowly excavated median line, apex feebly produced; ocular lobes distinct. *Elytra* much wider than prothorax, widest about middle, thence rather suddenly arcuate to apex; apex feebly notched; striate-punctate, punctures moderately large, subquadrate, partially concealed by clothing; interstices scarcely visibly (except at base) alternately raised. Four anterior *tibiæ* with small, acute teeth. Length 8, width $3\frac{1}{8}$; variation in length, 6-$8\frac{1}{4}$ mm.

Hab.—N.S.W.: Forest Reefs.

Apparently much closer to *decorum** than *lineatus;* from the description of the former it differs by its clothing and shoulders; from the latter (specimens of which I have from Gayndah) by being very much wider, differently clothed, and with more distinct ocular lobes. Of five specimens under examination none is distinctly marked; they all appear to have been covered with an ochreous exudation, which is, perhaps, entirely responsible for their dingy appearance, as in four of them four feeble, whitish, longitudinal stripes are traceable on the prothorax, and the sides, from head to apex of elytra, appear to be clothed with whitish scales.

PROSAYLEUS PHYTOLYMUS, Olliff.

This species belongs either to *Eutinophæa* or to *Maleuterpes.* I have two female specimens under examination and which have the anterior coxæ separated. Mr. Olliff describes the anterior tibiæ as possessing a spine, but makes no mention of a femoral spine, which could hardly have been overlooked if present.

MALEUTERPES SPINIPES, Blackb.

It is curious the strong superficial resemblance both of male and female that this species bears in miniature to the Tasmanian *Prostomus scutellaris.*

EUTINOPHÆA DISPAR, n. sp.

Brownish-red, legs and antennæ paler. Densely clothed with pale greyish-white scales more or less mottled with pale

* As in *decorum,* there is a strong resemblance to Mr. Pascoe's figure of *Ochrometa amœna.*

brown along middle of prothorax and elytra. Each prothoracic puncture with a seta not rising to the general level; each interstice of elytra with a regular (but very indistinct) row of setæ; under surface with slightly recurved setæ.

Head densely punctate, punctures themselves concealed, but traceable through clothing. Sides of rostrum between antennæ inwardly oblique to base. Funicle with first joint much stouter than and as long as second and third combined. *Prothorax* as long as or slightly longer than wide, sides moderately rounded and slightly the widest at about one-third from base, with crowded, moderately large, and deep punctures, each of which is traceable through clothing. *Scutellum* distinct. *Elytra* distinctly wider than prothorax, base truncate, sides scarcely visibly increasing in width to apical third; punctate-striate, striæ deep, but only moderately traceable through clothing, the punctures entirely concealed; interstices regular, flattened. Anterior coxæ separated;* tibiæ dilating to apex, the anterior straight above and feebly bisinuate beneath. Length, male $1\frac{1}{2}$, female $2\frac{1}{2}$ mm.

Hab.—Sydney.

Apparently close to *nana* (from S. Australia), but the clothing of that species apears to be uniform, whilst of the hundreds of specimens I have seen of this weevil the prothorax and elytra, especially in the males, are distinctly mottled. The colour of the derm can only be seen after the scales have been abraded. The size is remarkably constant I have not been able to find the least variation in size in the males, and the variation in the females is scarcely one-sixth of a millimetre. The species may be obtained abundantly in spring on the flowers of *Eriostemon lanceolatus.*

EUTINOPHÆA FALCATA, n. sp.

Colour varying from a pale to a dark brownish red; legs and antennæ pale red. Moderately densely clothed with pale yellowish scales, the elytra variegated in middle and towards base with chocolate-brown scales; under surface with pale scales, usually with a greenish tinge. Prothorax with small setæ in punctures scarcely rising to the general level; elytra with stout, depressed setæ.

Head not very densely punctate, punctures not very distinct through clothing. Eyes very prominent. Sides of rostrum between antennæ strongly and inwardly oblique to base. Funicle with first joint considerably stouter than

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* Mr. Blackburn, P.L.S., N.S.W., 1893, p. 255, notes the anterior coxæ of *E. nana* as being contiguous, a character not mentioned by Mr. Pascoe.

but noticeably shorter than second. *Prothorax* as long or almost as long as wide, subcylindrical, widest at one-third from apex; densely and rather strongly punctate, the punctures irregularly concealed by the clothing. *Scutellum* small and distinct. *Elytra* much wider than prothorax, shoulders slightly rounded, sides subparallel towards apex; striate-punctate, punctures large, suboblong, close together, moderately distinct through clothing; suture, third and fifth interstices raised about summit of posterior declivity. Anterior coxæ separated; anterior tibiæ longer than the others (which are almost straight), and strongly arcuate; claws separated only at apex. Length, 3 mm.

Hab.—N.Q.: Barron Falls (A. Koebele).

To the naked eye each elytron frequently appears to be supplied with two elongate white spots: one before and one behind the middle, sometimes only the posterior ones can be noticed. These spots are on the third (partly on the second) interstice, and become indistinct under a lens. Of thirteen specimens under examination I cannot find the least structural difference, but some which are more brightly clothed and with more distinct marks are probably the males. The scrobe when seen from the side looks somewhat like the letter T and completely isolates a squamose portion of the sides of the rostrum towards the apex. I have not considered it necessary to generically separate it, from *nana* and the preceding, on account of its falcate anterior tibiæ.

Rhadinosomus Lacordairei, Pasc.

This species (a beautiful figure of which has been given * by Mr. Waterhouse, from a specimen collected by Mr. Darwin near Sydney) is very variable in regard to colour, size, and the acuminated portion of the elytra (also sexually variable). *R. impressus* is but a feeble and not at all constant geographical variety; I have specimens from Swan River, W.A., and Tamworth, N.S.W., in which not the slightest difference can be found. In appearance *R. Tasmanicus* is very distinct, but I believe it to be a variety only. Of *R. frater* Mr. Blackburn says:—"This species is distinguished from all the previously described Australian *Rhadinosomi* by its head gradually narrowed from the eyes hindward." This is characteristic of the male of *R. Lacordairei*, judging by numerous specimens taken *in copula.* I have a variety from Mounts Kosciusko and Wellington, in which the colour is much paler than usual and which has the elytra unusually dilated in the female; its head also is rather densely clothed with black setæ.

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* Trans. Ent. Soc., vol. ii., pl. xvii. fig. 2.

Euthyphasis acuta, Pasc.

This species is recorded by Mr. Pascoe as coming from the Swan River. I have the species from Tasmania, and am inclined to think Mr. Pascoe's locality is erroneous. Mr. A. Simson informs me that about a year before the species was described he had sent a number of Tasmanian weevils (including this species—his number 3,216) to Mr. Fry, from whom Mr. Pascoe probably received his types. The species is distinct, and my specimens agree perfectly with Mr. Pascoe's figure, as well as with the specific and generic diagnoses.

Euthyphasis sordidata, n. sp.

Piceous; elytra piceous-brown, legs and antennæ dull red. Upper surface almost uniformly clothed with dingy-grey scales, a feeble pale line on each side of prothorax; under surface with whitish scales. Elytra with rather long setæ on the sides, at and near apex.

Head with the sides lightly rounded, densely punctate; eyes small, round, placed midway between base of head and apex of rostrum. Rostrum narrower than head; scrobes deep and oblique. Antennæ not extending to elytra; scape somewhat curved; first joint of funicle longer than two following combined; club somewhat elliptic. *Prothorax* slightly shorter than head and rostrum combined, noticeably longer than wide, base slightly wider than apex; median groove very feeble, punctures as on head and rostrum. *Elytra* subelliptic, regularly convex, about once and one-third longer than the rest of the body, wider than prothorax; each obsoletely produced at apex; shoulders oblique; seriate-punctate, punctures rather large and subapproximate; interstices feebly raised and regular. Under surface punctured as prothorax. Legs moderately long; femora somewhat thickened, the posterior extending almost to apex of second abdominal segment; anterior tibiæ bisinuate beneath; claw joint long. Length $3\frac{1}{2}$, width $\frac{3}{4}$ (vix.) mm.

Hab.—N.S.W.: Forest Reefs.

Euthyphasis lineata, n. sp.

Reddish-brown; legs and antennæ dull red. Upper surface with greyish or yellowish-white scales, almost uniform on head, forming feeble lines on elytra, and three moderately distinct lines on prothorax, the median being rather less distinct than the lateral. Under surface (except of head) rather densely clothed with white or whitish scales. Apex of elytra with short setæ.

Head, rostrum, *prothorax*, *under surface*, and *legs* as in the preceding species. Club of antennæ considerably longer than in the preceding. *Elytra* about once and one-half the length of the rest of the body; sides, from behind shoulders (which are oblique) to apical fourth, perfectly parallel; apex distinctly triangularly emarginate; seriate-punctate, punctures comparatively small and round; interstices regular, flat, considerably wider than punctures. Length 4½, width ¾ mm.

Hab.—W.A.: Geraldton.

OPHTHALMORYCHUS SPONGIOSUS, n. sp.

Reddish-brown; muzzle black, antennæ reddish-piceous. Densely squamose; scales of under surface and elytra of a dingy white, the latter with feeble spots of darker scales and with a moderately distinct spot on each side about apical third; prothorax and head with ferruginous-brown scales, the sides and median line whitish; rostrum very densely clothed with ferruginous-brown scales, having a very loose, spongiose appearance, which is caused by numerous small punctiform impressions (from each of which a seta arises); the scrobes in consequence appear to be very deeply sunk.

Head the length of prothorax, cylindrical, parallel-sided; densely punctate, punctures partially concealed; a triangular projection directed upwards and forwards over each eye and causing them to appear somewhat reniform. Rostrum somewhat longer than head, swollen about its middle, where it is wider than head; with a distinct longitudinal impression commencing just behind muzzle, and continued, but feeble, on head. Antennæ scarcely passing prothorax; scape short, deeply immersed in scrobe; funicle with subequal joints; club elongate-elliptic. *Prothorax* slightly longer than wide, base much wider than apex, sides rounded; densely punctate; median line appearing as a shallow groove. *Elytra* slightly more than half the total length, elongate, and somewhat elliptic; shoulders rounded, base on each side lightly raised; each produced at apex; seriate-punctate, punctures large, quadrate, approximate; third, fifth, and seventh interstices raised and thickened. *Metasternum* with a median depression, and which is continued on abdomen. *Legs* rather thin; posterior femora terminating at about the middle of third abdominal segment; tibiæ bisinuate beneath; claw joint long, claws feebly separated. Length 6⅓, width 1 mm.

Hab.—N.S.W.: Windsor (in flood debris).

This species might very well have been referred to *Euthyphasis*, but as Mr. Blackburn has erected the genus *Ophthal-*

morychus to receive a species having a peculiar process over each eye, processes reproduced in the present species, I have thought it best to refer it to the latter genus. The two genera are closely allied, and in common have many of the characters of *Rhadinosomus.* The above species must be very distinct from *O. angustus*, for, besides being considerably larger, its elytra are not conjointly rounded, the rostrum is wider in the middle than at its base or apex, and its clothing (slightly similar on the flanks of the prothorax) is most remarkable; the prothorax is longer than wide, and not bisulcate. Of *O. angustus* Mr. Blackburn says it has the rostrum "dilating greatly forward from its base in such fashion as to bear a certain resemblance to a funnel, the wide end of which is the apex of the rostrum." This is also true of the above species, but only in regard to its *under* surface.

Besides the specimens described I have two others under examination, in neither of which are the scales so distinctly coloured, being almost uniformly dingy grey, the scales on each side of the median line of the prothorax and on the rostrum being of a pale brown. In all three, however, the character of the scales on the rostrum is the same.

Ophthalmorychus (Methypora) parallelus, Lea.

At the time that this species was described I had not critically examined many weevils, and in consequence was easily led astray by its superficial resemblance to *Methypora postica.* The species, in fact, is very distinct from *Methypora*, having the remarkable lateral extension over each eye characteristic of *Ophthalmorychus;* although possibly a new genus will ultimately be required to receive it.* From the preceding species it differs (besides in many minor details) in having a much more parallel outline, the prothorax considerably longer than wide, and fully as long as head and prothorax combined, antennæ scarcely extending to anterior coxæ, and the legs very decidedly shorter and stouter.

Homœtrachelus hadromerus, n. sp.

Black; legs and antennæ red, club and claws brown. Densely clothed with rather stout, feebly glistening scales.

Head and rostrum feebly convex, the former with a very narrow impression between eyes. Rostrum very indistinctly depressed along middle. Scape about the length of two basal joints of funicle; of these the first is stouter and slightly longer than second. *Prothorax* transverse, base almost truncate, sides moderately rounded; densely and coarsely punc-

* There are at least three other species in the Macleay Museum having these peculiar processes, all of which appear to be undescribed.

tate, punctures almost concealed. *Scutellum* subtriangular. *Elytra* much wider than prothorax, feebly increasing in width to near apex, each strongly rounded at base; seriate-punctate, punctures rather large and subquadrate, appearing to be rather small and oblong when seen through clothing. *Femora* thick, scarcely clavate, edentate; tibiæ stout, with numerous small teeth. Length, male, $3\frac{2}{3}$ (rost. incl.), width, $1\frac{1}{3}$; female, $4\frac{1}{2}$ x 2 mm.

Hab.—W.A.: Geraldton (Hooper and Lea), Garden Island (Lea).

The small teeth on the tibiæ are more pronounced on the anterior pair, but on all they are frequently entirely concealed. The prothorax at first sight appears to be strongly bisinuate at the base. The colour of the scales appears to be scarcely the same in any two individuals; those of the under surface are more or less grey, in the male usually with a bluish, in the female usually with a greenish tinge, sometimes they are dead white. On the supper surface of the female the prevailing colour appears to be either a sober grey or green variegated with obscure gold; on the male the scales are also frequently grey, but are usually of a russet or golden brown; in many specimens of both sexes, however, the scales are of a dingy black.

SUB-FAMILY OTIORHYNCHIDES.

Myllocerus carinatus, n. sp.

Black; legs and antennæ reddish. Densely and uniformly clothed with pale green scales; a few small brown spots on the elytra. Muzzle with long setæ; prothorax with numerous stout setæ not rising above general level; elytra with two or three irregular rows on each interstice, but very dense on suture; under surface and legs with much finer setæ than on upper.

Head flat; a narrow impression between eyes, which is connected with apical triangle by a narrow shining carina. Curvature of scape more pronounced near base than near apex; two basal joints of funicle elongate, the first slightly longer than second, seventh longer than sixth. *Prothorax* widely transverse, base strongly bisinuate, sides very feebly rounded; rather coarsely punctate, the punctures almost concealed. *Scutellum* transverse. *Elytra* about once and one-fourth the width of prothorax, very feebly increasing in width to beyond the middle; striate-punctate, punctures round and moderately large, but appearing to be small and oblong through clothing. *Femora* clavate, feebly dentate. Length, $8\frac{1}{3}$ (rost. incl.); width, $2\frac{3}{4}$; variation in length, 6-$8\frac{1}{2}$ mm.

Hab.—N.W. Australia (Macleay Museum), King's Sound (W. W. Froggatt).

On the smaller specimens the spots of brown scales on the elytra are more pronounced; in none, however, do they encroach on the sides or suture. The stout setæ are of a pale yellow colour, and in some lights cause the upper surface (especially of the elytra) to appear to be of a pale golden green.

Myllocerus usitatus, n. sp.

Black; densely clothed with pale greenish-grey scales; the elytra with small brown spots marking many of the punctures; head and prothorax with numerous blackish specks. Elytra with rather numerous, but scarcely traceable, yellowish setæ.

Head almost flat between eyes. Rostrum with three feeble ridges, all of which are sometimes concealed, and of which the median one is less pronounced. Scape long, rather suddenly curved in middle; two basal joints of funicle elongate, the first noticeably longer than second. *Prothorax* moderately transverse, base rather strongly bisinuate, sides moderately rounded, with strong, concealed punctures. *Scutellum* as long as wide. *Elytra* much wider than prothorax, gently increasing in width to near apex; striate-punctate, punctures rather small, subquadrate, approximate, almost or quite concealed. *Femora* clavate, edentate. Length, $5\frac{1}{2}$; width, 2 mm.

Hab.—N.S.W.: Whitton.

The greenish tinge is more pronounced at the sides and on the under surface; on one specimen many of the scales are decidedly golden.

M. cinerascens, Pasc. *Hab.*—Geraldton.

M. Darwini, Blackb. (co-type).

Titinia brevicollis, Blackb.

Mr. Blackburn describes this species from "W. Australia." I have it from Geraldton and Garden Island; at both places it is common on a species of acacia. The elytral spots of pale scales vary from a dull, dead white to a pale green; sometimes the spots are entirely absent; in the female there is seldom a trace of golden lustre; in males in which the golden spots are very pronounced the legs are usually clothed with golden scales. The species is extremely close to *T. tenuis*.

Proxyrus lecideosus, Pasc.

An abundant and somewhat variable species. I have it from Geraldton, Dongarra, and Beverley.

Matesia, n. gen.

Head small. *Eyes* elliptic, rather coarsely faceted, almost touching, as much on rostrum as on head, and not interrupting the general outline of the former. *Rostrum* long and rather thin, basal three-fourths cylindrical, apex bent and narrowed; scrobes short, deep, subapical, a scarcely traceable depression on each side connecting them with eyes. *Antennæ* slender; scape considerably passing eyes; funicle with all the joints elongate; club elliptic, distinctly jointed. *Prothorax* subconical, base strongly bisinuate, without ocular lobes, not emarginate below. *Scutellum* moderately large and distinct. *Elytra* wider than and about thrice the length of prothorax. *Mesosternum* narrowly produced between anterior coxæ; side pieces very unequal, epimeron narrowly triangular, but preventing the episternum from reaching elytra. *Metasternum* the length of basal segment of abdomen; episterna moderately large, angularly enlarged in front. Two basal segments of *abdomen* large, sutures of all distinct, the first arcuate in middle. *Legs* long; coxæ large, anterior approximate, posterior not widely separated and extending to elytra; femora clavate; tibiæ rounded, posterior corbels open; tarsi rather long, third joint wide, deeply bilobed, claw joint elongate; claws free and rather stout. Elliptic, convex, squamose, winged.

Judging by the descriptions, the genus appears to be allied to *Euphalia* and *Atmesia*, from the former separated by the shape of the scape and prothorax and the long legs, and from the latter by the bisinuate base of prothorax, distinct scutellum, elongate metasternum, etc. The mentum is large and rounded anteriorly, the palpi are exposed, the rostrum beneath has distinct lateral sutures as well as a median one, the mandibles are prominent and acute; close behind the anterior coxæ is a remarkable tooth-like projection and which is directed backwards.

Matesia maculata, n. sp.

Brownish-black, shining; scape, tibiæ, and base of femora dull red. Pale green scales almost uniformly clothing the under surface, sparse along middle of rostrum, forming a spot at base of prothorax and numerous small spots on elytra.

Head smooth, finely and sparsely punctate, narrowed from base to eyes. Rostrum with the sides highly polished and finely punctate. Antennæ long and thin; scape slightly shorter than funicle, moderately curved, extending to beyond middle of prothorax; all the joints (but especially the two basal) of the funicle elongate. *Prothorax* convex, sides almost straight, base much wider than apex and strongly bisin-

uate; with small scattered punctures. *Scutellum* slightly longer than wide. *Elytra* considerably wider than prothorax, shoulders strongly rounded, sides parallel to near apex, apex feebly notched; striate-punctate, punctures moderately large and subquadrate; interstices regular and gently convex, much wider than punctures. *Legs* long; femora very feebly dentate; tibiæ fringed beneath with black setose hair, apex crowned with stiff black setæ. Length, $5\frac{1}{4}$ (rost. incl.); head and rostrum, $2\frac{1}{8}$; width, 2 (vix.) mm.

Hab.—N.W. Australia (Macleay Museum), King's Sound (W. W. Froggatt).

The femoral teeth are very small, and are invisible from most directions. On the elytra the spots have a decided tendency to become united at the sides; on both prothorax and elytra the interspaces between the spots of green scales are clothed with blackish scales, which, though individually rather large, are traceable with some difficulty; each of the elytral interstices has a row of pale semi-decumbent setæ, which, on some specimens, are very distinct, but scarcely traceable on others.

SUB-FAMILY LEPTOPSIDES.

Polyphrades vitis, n. sp.

Black, opaque; antennæ, tibiæ, and tarsi obscure reddish. Densely clothed with brown scales, speckled here and there with grey ones or very stout setæ, flanks of prothorax and elytra with patches of distinct white scales, a small patch on each side of middle more distinct on prothorax than on elytra. Under surface and legs with greyish-white scales, the femora annulate near apex; tibiæ with dense and long pale setæ.

Eyes elliptic-ovate, finely faceted. Rostrum almost twice the length of and decidedly narrower than head, apical plate triangular, produced behind in a carina, becoming very obtuse towards the base. Scape long, apex clavate, touching prothorax, almost the length of funicle; first joint of funicle the length of second and third combined; third to seventh gradually decreasing in length; third and fourth globular; fifth to seventh transverse; club elliptic, the length of four preceding joints. *Prothorax* slightly transverse, sides rather strongly rounded, apex slightly narrower than base; ocular lobes finely ciliate; disc rugosely punctate, but punctures entirely concealed. *Scutellum* indistinct. *Elytra* cordate, scarcely twice the length of prothorax, sides near base strongly rounded, base widely and shallowly emarginate, not ridged; striate-punctate, punctures large, but partially concealed; interstices wide and feebly convex. *Tibiæ* very

feebly dentate beneath; claws soldered together except at extreme apex. Length, $4\frac{1}{2}$ (incl. ros.), ; width, $1\frac{4}{5}$; variation in length, $3\frac{1}{3}$-$5\frac{1}{2}$ mm.

Hab.—W.A.: Coolup (J. Philippe), Swan River (Mrs. A. M. Lea).

The specimens from Mr. Philippe were sent in to the Department of Agriculture as being very destructive to the young shoots and leaves of the vine. The elytra are provided with setæ, but from no direction do these appear to be either wholly or partially upright; the pale scales are usually dull, but occasionally have a silvery or even golden gloss. There are several specimens under examination which appear to belong to this species, but which have not the very distinct patches of white scales; these patches appear to be more distinct in the females than in the males. The length of the scape in this and the three following species would seem to denote that they belong to *Cherrus*.

POLYPHRADES DESPICATUS, n. sp.

Black, opaque; antennæ, tibiæ, and tarsi obscure reddish. Densely clothed with brown scales, becoming obscure grey towards the sides. Under surface with grey scales, the abdomen in addition with pale setæ. Legs with grey scales, the femora with short, the tibiæ with long setæ.

Eyes elliptic-ovate, finely faceted. Rostrum decidedly longer and narrower than head, apical plate triangular, produced behind in a carina. Scape long, apex slightly clavate and almost touching prothorax, shorter than funicle. First joint of funicle the length of two following combined, fifth to seventh scarcely transverse; club elliptic-ovate, slightly shorter than four preceding joints. *Prothorax* feebly transverse, sides strongly rounded, base considerably wider than apex; ocular lobes feeble; disc densely and finely punctate in front, subrugosely towards base, but all punctures concealed in fresh specimens. *Scutellum* indistinct. *Elytra* ovate; base slightly, the middle considerably wider than prothorax; sides strongly and regularly rounded; striate-punctate, punctures considerably smaller than in the preceding species and almost entirely concealed, interstices wide and feebly convex. Anterior *tibiæ* acutely dentate beneath; claws soldered together for the greater part of their length, and slightly unequal in size. Length, $4\frac{1}{3}$; width, $2\frac{1}{3}$ mm.

Hab.—W.A.: Geraldton.

An obscure species.

POLYPHRADES EXOLETUS, n. sp.

Black; antennæ, tibiæ, and tarsi obscure dull red. Densely clothed with obscure brownish-grey scales, occasionally very

feebly mottled; the sides, especially head and base of rostrum, usually with paler scales than on disc. With numerous rather stout setæ, almost invisible from in front, but very distinct from the sides or behind. Under surface and legs with greyish scales and setæ.

Eyes elliptic-oval, finely faceted. Rostrum longer and narrower than head, apical plate distinctly triangularly notched in front, feebly produced hindward in a carina. Scape long, almost touching prothorax, thickened towards but not clavate at apex; first joint of funicle as long as the two following combined, none of them transverse; club elliptic-ovate. *Prothorax* transverse, sides strongly rounded, base wider than apex; ocular lobes distinct; disc in front finely punctate, punctures concealed, towards base feebly irregularly corrugated. *Scutellum* very minute. *Elytra* subcordate, at base scarcely wider than prothorax, increasing in width to about the middle; striate-punctate, punctures large, approximate, moderately distinct through clothing, very distinct at the sides; interstices wide, feebly convex. Anterior *tibiæ* stouter than usual, strongly curved towards apex and acutely dentate beneath; claws notched at apex. Length, $5\frac{3}{4}$; width, $2\frac{1}{2}$; variation in length, 5-6 mm.

Hab.—Swan River.

Specimens have been táken in abundance by means of the sweep net. On an occasional specimen the scales appear to have a slight golden lustre, but it is extremely faint; several have a very feeble spot of pale scales on each side of middle of base. The facets of the eyes, though small, are larger than in either of the preceding species.

Polyphrades extenuatus, n. sp.

Black, opaque; antennæ scarcely paler. Densely and almost uniformly clothed with grey scales and setæ having a rather loose appearance; on the under paler than on the upper surface and with a silvery lustre.

Shape and sculpture much as in the preceding species, but the prothorax strongly and rugosely punctate except about the apical sixth, and the elytral punctures much stronger, the tibiæ are not so wide at the apex and the claws are more distinctly separated. Length, 5; width, 2 mm.

Hab.—Swan River.

This species is very close to the preceding, but the different colour of the scales and very different punctures of the prothorax (obscured, however, by the clothing), appear to render it distinct.

Polyphrades setosus, n. sp.

Black, opaque. Densely and uniformly clothed with pale subochreous scales, and with very dense and regular stout

setæ. Scales of under surface, legs and antennæ slightly tinged with brown.

Eyes round and finely faceted. Rostrum short, stout, no longer and scarcely narrower than head; scrobes large and deep; apical plate strongly transverse, notched in front, a depression from its apex to head. Scape rather long and stout, curved, scarcely extending to prothorax, considerably shorter than funicle; funicle with cylindrical joints, the first shorter than the second and third combined, fifth to seventh transverse; club acutely pointed. *Prothorax* transverse, sides strongly rounded, base and apex subequal; disc densely and rugosely punctate or granulate, before the scales are removed appearing feebly transversely corrugate; ocular lobes not traceable. *Scutellum* very minute. *Elytra* oblong-ovate, no wider than but about twice the length of prothorax; striate-punctate, punctures large, subquadrate, approximate, distinct through clothing, interstices wide and moderately convex. Anterior *tibiæ* rather stout, distinctly curved at apex, with a few small teeth beneath; claws separated for fully half their length and slightly unequal. Length, 7; width, $2\frac{2}{3}$ mm.

Hab.—N.W. Australia (Macleay Museum).

A very distinct species, in shape resembling *nanus*. The setæ are more numerous and stouter than in any other species with which I am acquainted. The eyes are rather peculiar. On one specimen the deciduous piece of the left mandible is present; it is long (slightly longer than the eye), strongly curved, rounded outwardly and blade-like internally, and is of a shining reddish-brown.

Polyphrades granulatus, n. sp.

Black, opaque. Densely clothed with grey scales and with paler and dense setæ. Under surface and legs with greyish scales and setæ.

Head obtusely but distinctly granulate. Eyes rather large, ovate, moderately prominent, finely faceted. Rostrum stout, slightly longer than head, apical plate triangular, slightly raised, continued to between eyes by a narrow acute costa. Scape stout, not clavate, scarcely passing eyes; first joint of funicle as long as two following combined, fifth to seventh feebly transverse; club elliptic. *Prothorax* transverse, sides strongly rounded, base wider than apex; ocular lobes distinct; disc transversely irregularly wrinkled, the elevations punctate. *Scutellum* minute. *Elytra* oblong-ovate, wider than prothorax at base, feebly increasing in width to about the middle; striate-punctate, punctures large, quadrate, approximate, very distinct through clothing; interstices wide, feebly convex. Anterior *tibiæ* curved at apex, with a few

small teeth beneath; claws separated for about half their length. Length, 9½; width, 4¼ mm.

Hab.—Sydney.

The specimen described is from the collection of the late Mr. A. Sidney Olliff, and bears a label in the writing of the Rev. T. Blackburn, "Polyphrades sp. nov." In build it resembles *nanus*, from which it may be distinguished by its clothing and claws.

POLYPHRADES TUMIDULUS, Blackb.

I have numerous specimens from Geraldton (W.A.), which agree very well with Mr. Blackburn's description of this remarkable species, except that they vary from 2⅓ to 3 lines (not 3 to 4).

P. LONGIPENNIS, *Pasc.*	*Hab.*—S.A.
P. ŒSALON, Pasc.	*Hab.*—Mount Barker (W.A.).
P. PUSILLUS, Pasc.	*Hab.*—Geraldton.
P. NITIDILABRIS, Germ.	*Hab.*—S.A.
P. PAGANUS, Bohem.	*Hab.*—Sydney, Windsor, etc.
P. NANUS, Gyll.	*Hab.*—Sydney, etc.
P. LATICOLLIS, Fahrs.	*Hab.*—Swan River.
P. INCONSPICUUS, LAMINATUS, AND PICTUS, Blackb. (co-types).	

ESMELINA* STENOCERA, n. sp.

Black, subopaque; legs and antennæ reddish, tarsi darker than tibiæ. Clothed with round and somewhat golden scales, mixed on the elytra and under surface with pale, stout setæ. Tibiæ clothed all over with long and rather dense setæ, increasing in length from the base, claw joint with rather numerous and erect setæ.

Eyes ovate, finely faceted, prominent. Apical plate slightly longer than wide, feebly depressed along middle; punctate, connected with a narrow and deep ocular fovea by a very indistinct impressed line. Antennæ just passing base of elytra; scape not very stout, thickened at apex and feebly overhanging base of funicle; of the latter all the joints elongate and slightly decreasing in length; club thin, elongate-elliptic, distinctly four-jointed, all the joints longer than wide, the fourth very small. *Prothorax* feebly transverse, subcylindrical, the sides feebly rounded, base and apex equal; ocular lobes very obtuse; disc densely granulate, base feebly margined. *Scutellum* sloping. *Elytra* not raised at base, oblong-ovate, at base considerably wider than prothorax, feebly

* Mr. Blackburn (P.L.S. N.S.W., 1892, p. 122) appears to have doubts as to the propriety of referring this genus to the *Leptopsides*; to me the position (close to *Polyphrades*) assigned to it by Mr. Pascoe appears to be the correct one.

increasing in width to beyond the middle, shoulders subtuberculate; striate-punctate, punctures large, approximate, subquadrate; interstices wide and convex. *Legs* long; tibiæ straight except at apex, with numerous feeble teeth beneath. Length, 13; width, 5 mm.

Hab.—Swan River.

The club of the antennæ is very peculiar. The unique specimen described was obtained under bark of an *Eucalyptus.*

ESMELINA FLAVOVITTATA, Pasc.

The deciduous mandibular processes of this species are remarkably long. In a specimen under examination they are almost as long as the scape, highly polished, curved, narrow, sharp-edged internally, and cross at about their middle.

E. AUSTRALIS, Blackb. *Hab.*—Sydney, Como.

CHERRUS PLEBEJUS, Oliv.

Variable in regard to size and sexually variable in width. The elytral interstices are very variable in regard to their elevations and tuberosities, being sometimes wider and sometimes narrower than the striæ, the alternate ones are usually more highly elevated; the sutural interstices are always smooth and flattish. *C. opatrinus* and *ebeninus* appear to be synonyms.

CHERRUS INFAUSTUS, Oliv.

A variable species in regard to size and shape and the disposition and size of the elytral tubercles; *iodimerus* is without doubt synonymous.

CHERRUS CÆNOSUS, Fahrs.

With doubt I refer three specimens (from Armidale and Glen Innes) to this species. They are smaller than the usual run of *C. plebejus*, from which they may be at once distinguished by the suture of the elytra being tuberculate, and the other interstices tuberculate throughout, and scarcely or not at all alternately raised.

CHERRUS MASTERSI, Pasc.

A specimen under examination (from Mount Barker, W.A.) measures but 7¾ lines.

CHERRUS PUNCTIPENNIS, Pasc.

I have two specimens (from Donnybrook) which agree with Mr. Pascoe's description of this species, except that they are considerably larger (9½ and 11 lines). In both specimens the deciduous mandibular processes are present; they are stout and blunt, and are directed at right angles to the apex of rostrum.

Essolithna.*

Pephricus.†

The Rev. T. Blackburn, before describing some species of *Pephricus*, remarks‡ on the unsatisfactory separation of the Australian genera of the *Eremnides* from the *Leptopsides*, and gives notes on the variation of the claws; subsequently,|| when dealing with the *Leptopsides*, he makes almost exactly similar remarks on the claws.

Mr. Pascoe placed *Essolithna* in the *Leptopsides*, and *Pephricus* in the *Eremnides*. I am convinced that *Pephricus* should never have been placed in a different sub-family to that to which *Polyphrades* belongs, and, moreover, that it is synonymous with *Essolithna*. Both supposed genera have a short scrobe, rostrum transversely sulcate beneath, short metasternum, more or less distinct ocular lobes, stout antennæ, apex of rostrum with triangular plate (characteristic of most of the *Leptopsides)*, scutellum absent, third and fourth abdominal segments short, hind corbels open, eyes more or less rounded, and, in particular, one claw to each tarsus.☙ To this genus probably also belong the species described by Fahræus¶ as *Polyphrades cinereus*, *murinus*, and *perignarus*.

Of the described species I possess *Essolithna seriata*, Blackb., and *Pephricus squalidus*, Blackb., a specimen of each of which was obtained from Mr. Blackburn, and agrees exactly with his description. Of the others I believe I know *Essolithna rhombus*, Pasc., *Pephricus echimys*, Pasc., and *P. nanus*, Blackb. I do not think that the difference in direction (the shape is almost exactly the same) of the scrobe between *seriata* and *squalidus* should distribute these species between two genera and sub-families.

The Australian genera of the Otiorhynchides are in a very confused state, and will probably remain so until a much more natural system than Lacordaire's is found for separating the genera and higher divisions. It seems very peculiar to constitute and widely separate sub-families all the species of which have deciduous mandibular processes; possibly this system will be along the lines laid down by Le Conte ** and followed by Le Conte and Horn.††

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* Pascoe, Journ. Linn. Soc., 1869, p. 458.

† Pascoe, T.E.S., 1870, p. 184.

‡ T.R.S., S.A., 1892, p. 230.

|| Scientific Results of the Elder Exploring Expedition, p. 49.

☙ A character (which might perhaps be regarded as only of specific value) possessed by all the species except *Kingiæ* is the presence of dense circular and more or less flattened prothoracic granules. Similar granules are to be seen on some of the species belonging to *Polyphrades* and *Cherrus*.

¶ In Schönherr's Gen. et Spec. Curc.

** American Naturalist, July, 1874.

†† The Rhynchophora of America North of Mexico.

ESSOLITHNA PLUVIATA, Pasc.

All the species I have under examination are much smaller than the size ascribed to this species (4 lines), the largest being less than 3 lines.

ESSOLITHNA RHOMBUS, Pasc.

Four specimens under examination possibly belong to this species; they differ from Mr. Pascoe's description in having punctate granules and the elytral interstices convex. They are from Champion Bay, and vary in length from $1\frac{3}{4}$ to $2\frac{1}{6}$ lines. The species differs from *seriata* (which it much resembles) in being smaller, with a shorter scape, basal joints of funicle differently proportioned and elytral suture thickened posteriorly.

PEPHRICUS ECHIMYS, Pasc.

I have three specimens under examination, which I believe belong to this species. The base of the rostrum, however, is distinctly transversely impressed: a character not mentioned by Mr. Pascoe. The species must be very close to *Polyphrades cinereus*, but the elytral suture of that species is described as subcarinate towards apex; from *P. murinus* and *perignarus* it may be distinguished by the long elytral setæ.

PEPHRICUS NANUS, Blackb.

Three specimens (from Swan River) probably belong to this species. They vary in length from $1\frac{1}{4}$ to $1\frac{3}{4}$ lines. One of them is without pale markings; two of them have a moderately distinct spot on each side at base of elytra (as mentioned by Mr. Blackburn); and one has in addition a distinct lateral stripe on the prothorax. The rostrum is as described.

Rostrum transversely impressed at base.
  Upper surface with distinct erect setæ.
    Rostrum flat between antennæ ... *echimys*, Pasc.
    Rostrum concave between antennæ ... *fissiceps*, n. sp.
  Upper surface without erect setæ.
    Funicle with second joint slightly longer than first ... ... *seriata*, Blackb.
    Vice versa ... ... *rhombus*, Pasc.
Rostrum not impressed at base.
  Elytra with distinct, erect setæ.
    Elytra striped, non-maculate .. *militaris*, n. sp.
    Vice versa ... ... *maculata*, n. sp.
  Elytra with short setæ, or if with long then it is strongly recurved.
    Scape slightly increasing in thickness to apex ... ... *terrena*, n. sp.
    Scape much wider at apex than at base.

Scrobe distinct to eye ... ... *Kingiæ*, n. sp.
Scrobe terminated before eye.
Elytra not much wider than prothorax ... ... *squalida*, Blackb.
Elytra considerably wider ... *nana*, Blackb.
Elytra without setæ ... ... *coraipennis*, n. sp.

ESSOLITHNA FISSICEPS, n. sp.

Black; legs and antennæ obscure red. Moderately densely clothed with round, grey scales, nowhere (in two specimens) forming a pattern, distinct or otherwise. In addition with distinct erect setæ, moderately dense and rather short on prothorax, and long on elytra, on the latter forming a regular series on each interstice; under surface with decumbent setæ.

Rostrum distinctly transversely impressed at base, feebly concave between antennæ, sides above scrobes inwardly oblique. Antennæ thinner than usual; scape fully extending to prothorax; first joint of funicle as long as two following combined, second noticeably longer than third, the others not at all or scarcely transverse. *Prothorax* convex, feebly transverse, sides distinctly, base feebly rounded; with crowded, flat, and more or less circular granules. *Elytra* obovate, at base not much wider than base of prothorax, gradually enlarging posteriorly; punctate-striate, striæ distinct, punctures rather small, subquadrate, scarcely visible through clothing; interstices regular, gently convex. Length, $4\frac{1}{6}$; width, $2\frac{1}{3}$ m.

Hab.—W.A.: Geraldton, Swan River.

ESSOLITHNA MILITARIS, n. sp.

Black; antennæ, tarsi, and tibiæ obscure reddish brown. Densely clothed with scales varying in colour from white to a pale slaty-brown or fawn; sides and under surface with white scales on flanks of head and prothorax, sometimes with a violaceous gloss; elytra with the white scales forming distinct stripes on the sutural and seventh interstices, and less distinct ones on the third and fifth; legs with white scales, the four posterior femora with pale brown rings. Prothorax with short, dense, erect setæ; elytra with long, erect setæ placed in a regular row on each interstice; head and legs with moderately long setæ.

Rostrum very feebly concave between antennæ; scrobes causing the sides above them to appear slightly inwardly oblique. Antennæ moderately long; scape extending to prothorax; first joint of funicle as long as two following combined, fourth to seventh transverse. *Prothorax* and *elytra* as in the preceding species, except that the elytral punctures are larger and are more distinct through clothing. Length, $4\frac{4}{5}$; width, $2\frac{1}{3}$; variation in length, 4 to 5 mm.

Hab.—W.A.: Swan River, Pinjarrah, Darling Ranges.

The description of the clothing has been taken from a very distinctly marked specimen; in most of those under examination more or less distinct stripes are noticeable, but in a few the elytra are uniformly clothed with dingy scales; all have the flanks of the prothorax with white scales, but no markings on the disc; on several specimens the head is entirely clothed with white scales.

ESSOLITHNA MACULATA, n. sp.

Black; antennæ and legs obscure red. Densely clothed with pale brown or slaty brown scales, more or less distinctly mottled with darker and paler scales, especially on the elytra; sides, under surface, and the greater part of the legs with white scales. Setæ much as in the preceding species.

Rostrum slightly concave between antennæ, with a feeble median carina, sides between scrobes distinctly inwardly oblique. Antennæ moderately long; scape extending to prothorax; first joint of funicle as long as second and third combined, third to seventh transverse. *Prothorax* feebly convex, sides strongly rounded in male, rather less strongly in female, base truncate, with crowded, flat, circular granules. *Elytra* rather briefly obovate, scarcely twice the length of prothorax; striate-punctate, punctures moderately large, subquadrate, moderately distinct through clothing. Length, 4; width, 2; variation in length, 3 to 4½ mm.

Hab.—W.A.: Mount Barker (R. Helms).

The scales on the elytra never assume a striped appearance; the white scales sometimes cover a third of the surface, and are usually more plentiful on the shoulders and behind the middle; the larger (female) specimens are more uniformly clothed.

ESSOLITHNA TERRENA, n. sp.

Black; antennæ and legs obscure reddish-brown. Densely clothed with muddy brown scales, scarcely variegated, except on femora and tibiæ, and very indistinctly so on head. With moderately long but strongly curved and decumbent setæ, which are scarcely visible except from the sides.

Rostrum flat and almost parallel-sided between and behind scrobes. Antennæ moderately long; scape comparatively thin, feebly increasing in width to apex, extending to prothorax; first joint of funicle as long as second and third; second as long as third and fourth; third to seventh transverse. *Prothorax* as long as wide, sides gently rounded; disc with very feeble, scarcely raised, subgranular elevations not at all distinct even when the scales have been abraded. *Elytra* elliptic-ovate, sides near base suddenly dilated, then

parallel-sided to one-third from apex; striate-punctate, punctures moderately large, not at all quadrate and not visible through clothing; interstices regular and gently convex. Length, $3\frac{1}{3}$; width, $1\frac{1}{2}$; variation in length, $2\frac{1}{2}$ to $3\frac{1}{3}$ mm.

Hab.—Swan River.

The elytra are (proportionately to the prothorax) much wider than in any species with which I am acquainted, being (at their widest) almost twice the width of prothorax. The prothoracic granules are completely concealed by the clothing, and even after this has been removed they are traceable with difficulty. With the exception of *nana* it is the smallest species hitherto described.

Essolithna cordipennis, n. sp.

Black; tibiæ reddish, antennæ obscure piceous-brown. Densely clothed with sooty scales and with greyish or white scales sparsely distributed, and causing the surface to appear speckled. Elytra without, prothorax and head with very indistinct, legs with moderately distinct, setæ.

Rostrum flat, a narow impression from apical plate to between eyes, sides between and behind scrobes slightly inwardly oblique. Scape stout, noticeably shorter than funicle; first joint of the latter as long as second and third combined; third to seventh transverse. *Prothorax* strongly transverse, sides moderately, base feebly rounded; with dense circular, strongly depressed granules. *Elytra* subcordate; at base noticeably wider than prothorax, sides more or less arcuate from base to apex; striate-punctate, punctures not very large (sutural rows largest), quadrate, scarcely traceable through clothing; interstices feebly convex, and almost regular. Length, 4 (vix.); width, 2; variation in length, $3\frac{3}{4}$ to $4\frac{1}{3}$ mm.

Hab.—W.A.: Geraldton.

Evidently close to *umbratus*, but differently clothed and with only the tarsi reddish.

Essolithna kingiæ, n. sp.

Black; tarsi reddish, antennæ obscure piceous-brown. Densely clothed with sooty brown scales; head and front and sides of prothorax variegated with white scales, which have a more or less decided tinge of green; elytra obscurely variegated with whitish scales; under surface and legs with dingy scales; femora feebly ringed. Upper surface with moderately stout setæ: on prothorax rather dense and recurved, on elytra almost flat (except at base, where, however, they are strongly recurved), and forming a regular series on each interstice.

Eyes more coarsely faceted than usual. Rostrum continuing the convexity of the head; flat between antennæ;

scrobes deep, distinct to but becoming shallow and curved at eyes; sides between and behind them straight, except towards base, where they become slightly outwardly oblique. Scape rather strongly curved, stout, much wider at apex than base, not extending to prothorax, shorter than funicle; first joint of the latter longer than second, but not as long as second and third combined; third to seventh strongly transverse. *Prothorax* feebly transverse, moderately convex, sides strongly, base moderately strongly rounded; without granules, but with large, rounded, deep punctures or foveæ, which are more or less traceable through clothing. *Elytra* briefly subcordate, base noticeably wider than base of prothorax, and rather strongly emarginate; seriate- (scarcely striate-) punctate, punctures much larger than usual (but smaller than those on prothorax), and distinct through clothing, interstices feebly convex and regular, except that the second is slightly wider than the others. Length, 3½; width, 2 mm.

Hab.—W.A.: Pinjarrah (on *Kingia australis*).

This species is decidedly aberrant, but I have thought it best to place it in *Essolithna*, as the only really important features in which it differs are the length of the scrobe and the total absence of prothoracic granules. It is a much shorter and stouter species than any other with which I am acquainted.

LEPTOPS GRANULATUS, n. sp.

Moderately densely clothed with scales varying from ochreous to dark reddish brown; the elytra in places with feeble interrupted pale fasciæ. Abdomen and legs with long thin setæ.

Head somewhat flattened; eyes ovate, not twice as long as wide. Rostrum comparatively thin; deeply channelled in middle, the channel divided in middle by a thin carina, towards each side with a slightly curved sulcus terminating before eye and antennæ; scrobes sinuous, deep, and narrow, distinctly terminated just before eyes; intervening raised spaces punctate. Antennæ long and thin; all the joints of the funicle considerably longer than wide, the first a little longer than third, and shorter than second. *Prothorax* almost cylindrical, longer than wide (4 x 3 $\frac{4}{5}$), widest just behind apex; with numerous large granules or small tubercles, each with a setose-puncture; median line feebly marked towards base, more noticeably towards apex. *Elytra* strongly convex, at base scarcely wider than prothorax, widest before the middle; striate-punctate, punctures moderately large, round and not approximate; interstices with numerous shining granules, the third and fifth raised and subtuberculate at summit of posterior declivity. *Legs* very long; femora with

numerous flattened shining granules; tibiæ less noticeably granulate. Length from apex of eyes, 15; rostrum, $4\frac{1}{3}$; width, $6\frac{1}{2}$ mm.

Hab.—Queensland.

My unique specimen was labelled "Qd.," and was probably taken by the late Mr. George Barnard, of Coomooboolaroo. The species (which in shape resembles a gigantic *Apion)* is very distinct from any other known to me; it appears to resemble *subfasciatus* (Pascoe), but that species is described as having a short scutellar stria, the scrobes "ab oculis remotis," and the prothorax subtransverse.

Leptops nodicollis, n. sp.

Densely clothed with pale ochreous scales becoming subferruginous on disc of elytra. Rather densely covered with stout setæ, paler on antennæ, abdomen, and legs than elsewhere, and very dense on rostrum, tibiæ, tarsi, and tubercles and suture of elytra.

Head slightly raised between the eyes; eyes elongate-elliptic. Rostrum stout; rather shallowly channelled in middle, a feeble ridge dividing the channel into two; a rather deep and almost straight sulcus continued from antennæ to near eyes, a short sulcus between it and scrobe; scrobes behind antennæ almost straight, shallow, and terminating before eyes. Antennæ long, rather stout; funicle with all the joints longer than wide, the first longer than second, the others gradually decreasing to apex. *Prothorax* subcylindrical, apparently longer than wide, but really transverse (male $3\frac{1}{2}$ x $3\frac{2}{3}$); somewhat rough, but scarcely tuberculate, a shallow transverse impression interrupted by a small, flattened, shining tubercle in middle; median line marked at apex by a subpyriform impression. *Elytra* wider than prothorax at base, sides much enlarged (but almost straight) to beyond middle; each elytron very feebly produced in middle at base; seriate-punctate, punctures in male deep and moderately close, in female shallower and distant; interstices scarcely raised, posterior declivity almost vertical, marked at summit by a transverse row of four strong, subconical tubercles, of which those on the third interstices are larger than those on the fifth. Length, male $13\frac{1}{2}$, female 19; rostrum, male $2\frac{2}{3}$; width, male 7, female $10\frac{2}{3}$ mm.

Hab.—Cairns (G. Masters).

Allied to *tuberculata* (Boheman), but with stouter rostrum and antennæ, more irregular prothorax, and the shape and tubercles of elytra different.

Leptops maleficus, n. sp.

Densely clothed with ochreous-grey scales, on different individuals varying from almost white to a dingy brown, and

sometimes with a feeble greenish tinge. Rostrum, tibiæ, and tarsi with dense, short, stout setæ, on prothorax shorter and sparser, on elytra moderately dense, and towards the sides and on tubercles becoming longer, darker, and straggling; undersurface and legs with long pale setæ.

Head, rostrum, and antennæ as in preceding, except that the antennæ are thinner. *Prothorax* subcylindrical, in male apparently longer than wide, but at widest as wide (male, 3 x 3); at sides with numerous transverse irregular impressions; median line marked in middle by a raised, shining, somewhat elliptic tubercle. *Elytra* considerably wider than prothorax at base, shoulders oblique, scarcely dilated towards apex in male, strongly in female; seriate-punctate, punctures comparatively small and distant; third and sixth interstices tuberculate from base to summit of posterior declivity, which is crowned with a transverse row of four large tubercles, conical in male, subconical in female, the outer large tubercles are on the fifth (not the sixth) interstice, and immediately below them are several smaller ones; several feeble tubercles on each side near apex. Length, male 13; female $19\frac{1}{2}$; rostrum, male $3\frac{2}{3}$; width, male $6\frac{2}{3}$, female $10\frac{1}{4}$.

Hab.—N.Q.: Barron Falls (A. Koebele); Goondi River (W. Freeman).

This species is reported to be very destructive (both in its adult and larval stages) to sugar cane. From the preceding species (which it greatly resembles) it may be distinguished by its elytral setæ, but especially by the tubercles of the third and sixth interstices; in the latter character it approaches *tuberculata*, but the elytra are not at all rounded, as in that species, and the prothorax is different.

Leptops setosus, n. sp.

Male. Densely clothed with scales having a somewhat coppery hue, with (especially on the under surface) a more or less rosy tinge; elytral tubercles, muzzle, tarsi, coxæ, and knees more or less distinctly tinged with green. Densely covered with stout, short, testaceous setæ, longer and paler on antennæ except upper surface of scape; abdomen with the usual setæ more or less intermingled with long, pale, hair-like setæ.

Head feebly depressed between eyes. Rostrum stout; grooved in middle; a short, deep sulcus towards each side; scrobes short, strongly curved, shallow, terminating considerably before the eyes. Antennæ stout; scape short, stout, curved; joints of funicle feebly decreasing in width and length, the second very slightly longer than the first, the others subcylindrical, but all longer than wide. *Prothorax* considerably narrower at apex than at base, slightly trans-

verse ($3\frac{2}{3}$ x $4\frac{1}{2}$), with a number of rather large, deep, and irregular impressions. *Elytra* about once and one-half the width of prothorax at base, more parallel-sided than is usual in the genus, base of each strongly produced in the middle; shoulders oblique, tuberculate; seriate-punctate, punctures strong, deep, moderately close, subgeminate; third and sixth interstices tuberculate from base, the tubercles of third terminating in a large one before summit of posterior declivity, the fifth with a larger one at or just below summit, a small tubercle on each side equidistant between summit and apex. *Legs* moderately long; femora thicker than usual. Length. $15\frac{1}{2}$; rostrum, $3\frac{2}{3}$; width, $6\frac{2}{3}$ mm.

Hab.—N.S.W.: Grafton (E. de P. O'Kelly).

The specimen described when received by me was labelled "*Leptops tuberculata*, Bohem."; it is, however, not that species, from which (and all its allies known to me) it may be at once distinguished by the position of the four larger tubercles, the inner pair being anterior to the outer, instead of posterior as is usually the case.

Leptops canaliculatus, n. sp.

Male. Sparsely clothed with pale, short setose scales, causing the derm (both of upper and under surface) to appear slightly hoary; scutellum and rostral excavations densely squamose; antennæ and legs with somewhat glassy scales, intermingled with short, stout, pale setæ.

Head wide, three impressions between eyes, of which the median one is largest. Rostrum wide, strongly dilated to apex; two strong median channels separated by a strong, rounded, and narrow carina; sulcate towards each side; scrobes deep, curved, posteriorly turned up, and joining in with sulci and continued as the lateral impressions near eyes. Antennæ short, rather stout; first joint of funicle as long as second, but apparently shorter. *Prothorax* transverse (6 x 8), sides rounded, decreasing from near apex to base; a strong subquadrate excavation in front of middle; with numerous irregular, shining, vermiform elevations, and with a few granules or small tubercles towards apex. *Elytra* oblong-ovate, not much wider than prothorax at base; densely and coarsely punctate, punctures separated by narrow transverse ridges; third interstice with a row of tubercles, small and rounded at base, becoming larger and conical towards and the largest terminating at summit of posterior declivity; fifth interstice with a few small tubercles in middle, seventh with smaller but more acute tubercles than on third, the largest just below summit of declivity, the next largest and the most acute between it and apex; a small conical tubercle on each side of suture below summit. *Abdomen* irregular towards

the sides, the apical segment channelled down the middle and with a subelliptic impression on each side. Length, 24; rostrum, $6\frac{1}{3}$; width, $10\frac{1}{2}$ mm.

Female. Differs in being much wider, elytra more rounded, tubercles more rounded and smaller, punctures shallower and more irregular, etc. Length, $25\frac{1}{2}$; width, 14 mm.

Hab.—N.S.W.: Mossgiel (C. Fuller).

Belonging to the *tribulus* group, but abundantly distinct from any with which I am acquainted. In both sexes there is a feeble subconical process on each side in front of the anterior coxæ.

LEPTOPS BRACHYSTYLUS, n. sp.

Male. Densely clothed with somewhat ochreous scales (variable individually to a mottled sooty black); abdomen with sooty scales, the sides subochreous; each of the femora with a feeble sooty ring. Above with rather sparse, stout setæ, scarcely denser on rostrum than on prothorax, antennæ densely setose, the setæ increasing in length to apex of funicle; legs and sides of abdomen with rather long, pale setæ.

Head feebly convex, a deep linear impression between eyes. Rostrum stout; feebly grooved in middle, nowhere with shining carina; between middle and each side with a strong and strongly curved deep sulcus, which opens posteriorly near the upper base of rostrum. Scrobes short, deep, oblique, terminated considerably before and beneath eyes. Antennæ rather stout; scape short (scarcely the length of four basal joints of funicle), considerably enlarged to apex; second joint of funicle slightly longer than first, the joints from the third to fifth feebly decreasing, the sixth and seventh feebly increasing in length; club the length of three preceding joints. *Prothorax* transverse ($3\frac{1}{2}$ x $3\frac{3}{4}$); subtuberculate; more or less irregularly excavated in middle, a transverse impression continued across middle, an impression on each side of apex. *Elytra* considerably wider than prothorax; shoulders oblique, tuberculate; sides subparallel to near apex; seriate-punctate, punctures moderately large, round, deep, distant; each with twelve conical tubercles, four on the third, including the three largest, the fourth largest of all, and at summit of posterior declivity, between it and apex, a very small tubercle; three on the fifth, two on the seventh, one on shoulder, and a small one slightly behind it. Length, $12\frac{2}{3}$; rostrum, $3\frac{1}{4}$; width, $5\frac{3}{4}$ mm.

Female. Differs in having shorter and more rounded elytra, tubercles larger at base, and subconical, and antennæ shorter and stouter. Length, $14\frac{1}{2}$; width, $7\frac{3}{4}$ mm.

Hab.—Cairns (G. Masters), Barron Falls (A. Koebele).

The rostrum and antennæ are very peculiar; the clothing appears to be easily abraded, as it is only perfect in two out of seven specimens under examination. The species is allied to *ferus* (Pascoe), from which it may be readily distinguished by the absence of sutural tubercles at the summit of posterior declivity.

Leptops horridus, n. sp.

Male. Densely and uniformly clothed with scales varying on different specimens from slaty-grey to ochreous and dark brown; abdomen with an elongate, subelliptic, sooty-black patch. Moderately densely covered with short, stout setæ, denser on rostrum than elsewhere; antennæ and legs with pale elongate setæ.

Head with a feeble transverse impression between eyes. Rostrum moderately stout; with a narrow deep channel (more or less obscured by scales) in middle; a short, deep, somewhat curved sulcus on each side; scrobes short, deep, oblique, terminating considerably before eyes. Antennæ moderately long; scape short; joints of funicle subcylindrical, the second longer than first, all of them longer than wide. *Prothorax* feebly transverse (4 x $4\frac{1}{2}$), with several irregular transverse impressions; excavated along middle, the excavation interrupted in middle, anteriorly being horseshoe-shaped, posteriorly irregularly transverse, on each side in front an elevated ridge margining excavation. *Elytra* considerably wider than prothorax, subparallel to near apex; subseriate-punctate, punctures large, more or less rounded, distant or approximate; suture at summit of posterior declivity with two long subcylindrical tubercles scarcely conjoined at their bases; third interstice with four tubercles, of which the basal one is small, and the fourth (before the summit) larger, but not longer, than the sutural; five acute tubercles forming a row almost parallel with those on the third, but on different interstices, the basal one on shoulder, and directed slightly forward, the fifth on fifth interstice level with and very similar to those on suture; a small tubercle on each side near apex, and a small one just behind shoulder. Length, 16; rostrum, $4\frac{1}{4}$; width, $7\frac{1}{2}$ mm.

Female. Differs in having the elytra slightly more rounded and shorter, the tubercles larger at their bases, and less acute, and the humeral one not at all projecting forward. Length, $18\frac{1}{2}$; width, $8\frac{1}{2}$ mm.

Hab.—Cairns (G. Masters), Barron Falls (A. Koebele).

A narrow, elongate species, not close to any with which I am acquainted; it perhaps belongs to the *tribulus* group.

Leptops elegans.

Male. Head and rostrum with black setæ and white scales intermingled, upper surface of scape with dense blackish setæ; club (except base) brown; prothorax with black scales and setæ, median line marked by white, pink-tinted scales; elytra with sooty-black scales, a very distinct and dense sutural line of snowy scales, at the base pink-tinted; sides from base to apex narrowly margined with snowy scales, a short stripe behind each shoulder tinted with pink. Under surface and legs with snowy scales; flanks of sterna, a spot on each of the anterior coxæ and a blotch on each side of abdomen sooty.

Head densely punctate, punctures partially concealed. Rostrum less robust than usual; scarcely grooved in middle, but with a thin, shining carina; a short sulcus on each side; scrobes short, oblique, shallow, terminated considerably before eyes. Antennæ moderately long; scape as long as funicle, straight, very feebly thickened towards apex; second joint of funicle slightly longer than first; fourth to sixth transverse. *Prothorax* cylindrical, apparently transverse, but near apex slightly wider than long (male 3 x $3\frac{1}{4}$); shallowly excavated along median line; with numerous punctate granules or obtuse tubercles. *Elytra* considerably wider than prothorax; shoulders oblique, each with a sharp, conical tubercle; sides subparallel to near apex; strongly punctate; third, fifth, and seventh interstices with rather sharp, conical tubercles, small except at summit of posterior declivity on third and fifth. *Legs* rather long and slender. Length, 12; rostrum, $3\frac{1}{4}$; width, 5 (vix.) mm.

Female. Differs in having the dark prothoracic and elytral scales of a sooty brown, the white scales slightly tinged with yellow, and nowhere tinted with pink, almost the entire sides of the elytra with whitish scales, and a few whitish ones about some of the tubercles; the under surface is nowhere distinctly blotched with dark scales. The elytra are considerably wider, widen posteriorly, and the tubercles are less acute. Length, 16; width, $7\frac{3}{4}$ mm.

Hab.—N.Q.: Endeavour River (G. Masters), Somerset (C. French).

A beautiful species approaching the *humeralis* group, but I do not know a species with which it can be satisfactorily compared. Mr. Pascoe* refers *Hipporhinus clavus*, Fahrs., to *Leptops*. I have not seen M. Olivier's figure of that species, but it is described by Fabricius as "Albicans, thorace canaliculato; coleopteris spinosis; lineolis tribus baseos rubris." It is possible, though it seems hardly possible, that *clavus* is the above described species; *elegans* could scarcely be called

* Ann. and Mag. Nat. Hist., 1873, p. 3.

"albicans," the male (the only sex having three reddish lines at the base) being clothed with (to the naked eye) deep black scales, except along the suture and sides of elytra and middle of prothorax.

In the type female the deciduous mandibular processes are present; they are long (nearly as long as the three basal joints of funicle), thin, curved towards apex, and sharp internally.

LEPTOPS SPINOSUS, Fahrs.*

This species (which I have from Swan River, Bridgetown, Donnybrook, Karridale, and Lake Muir) is common and variable. Specimens under examination range in length from 7 to 15 mm. (rostrum included). When alive and fresh they are usually densely covered with small, round, white scales and short, whitish setæ, mixed with a pale ochreous dust or meal. The clothing, however, is easily abraded, and the dust is lost in alcohol. In many specimens the scales become sooty and form a large discal patch on the elytra and occasionally on the prothorax; occasionally the whole of the scales have a rosy or golden gloss. In the female the tubercles are less numerous than in the male, are usually (but not always) obtuse, and in some specimens the lateral series almost vanish. The median prothoracic excavation disappears in some specimens. The rostrum is usually indistinctly carinate; sometimes the carina is very distinct, or it may be even replaced by a shallow groove.

LEPTOPS SQUALIDUS, Bohem.

L. Hopei is undoubtedly a synonym of this species, as queried by Fahræus in describing it, and so noted by Mr. Pascoe.† It is one of the most common and destructive species of the genus.

LEPTOPS (CHRYSOLOPUS) TUBERCULATUS, W. S. Macl.

In Masters' catalogue *tuberculatus* is credited to Bohemann. It appears to be the same species (and probably the same specimen) described by W. S. Macleay.‡ Bohemann marked it as Hope M.S., having evidently been unaware (as pointed out by Sir Wm. Macleay)‖ of the existence of W. S. Macleay's paper.

LEPTOPS ECHIDNA, W. S. Macl.

The type specimen of this species with the label attached *"Chrysolopus (?) echidna,* McL., New Holland, Capt. King,"

* I have little doubt but that my identification of this species is correct, and further that *L. dorsatus*, Pasc. is one (there are probably others) of its synonyms.

† Ann. and Mag. Nat. Hist., 1873, p. 3.

‡ King's Survey II., app. p. 445.

‖ T.E.S., N.S.W., I., p. 267.

in the handwriting of the late W. S. Macleay, is in the Macleay Museum. In Masters' catalogue it appears as a manuscript synonym of *tribulus*, but it is neither. It was described in King's Survey II., 1827, app. p. 445. The specimen is a female. Compared with a female of *tribulus* it differs in having the median prothoracic excavation much wider and larger, and also with rather strong lateral excavations, somewhat as in *acerbus*, but more pronounced; the tubercles on the elytra at a glance resemble those of *tribulus*, but differ essentially in the absence of a conjoined pair at the summit of the posterior declivity, the tubercles at the apex of the first row (on the third interstice) are large, and appear to be sutural, but a brief look is sufficient to truly locate them.

L. HUMERALIS, Germ. *Hab.*—S.A.
L. COLOSSUS, Pasc. *Hab.*—Geraldton.
L. DUBOULAYI, Pasc. *Hab.*—Geraldton.
L. SUPERCILIARIS, Pasc. *Hab.*—Forest Reefs, Dalmorton.
L. TETRAPHYSODES, Pasc. *Hab.*—Tweed and Richmond Rivers.
L. FERUS, Pasc. *Hab.*—Cairns.
L. TRIBULUS, Fabr. *Hab.*—N.S.W., Vic., and Tas.
L. SPINIGER, Fahrs. *Hab.*—Esperance Bay.
L. INTERIORIS, Blackb. (co-type).

ETHEMAIA APICALIS, n. sp.

Black; antennæ and tarsi dull red. Densely clothed with muddy grey scales. Prothorax with blackish setæ marking position of punctures; elytra with pale setæ, sparse on alternate interstices, more numerous on posterior declivity, and rather dense on tubercles; legs with whitish setæ.

Head and rostrum slightly convex, the convexity apparently caused by two almost concealed ridges. Rostrum short, between antennæ and eyes subquadrate, near mandibles visibly punctate. *Prothorax* subcylindrical, slightly narrower at apex than at base, feebly longitudinally impressed along middle and near sides; sides feebly transversely impressed about the middle; densely and coarsely punctate, punctures entirely concealed by scales. *Elytra* much wider than prothorax, sides subparallel to near apex; shoulders rounded, somewhat thickened; seriate-punctate, punctures large, round, entirely concealed by scales; third, fifth, and seventh interstices distinctly raised, the third and fifth with a distinct conical tubercle at summit of declivity, the fifth with an additional smaller tubercle before summit; a small but very distinct truncate tubercle on each side of apex. *Under surface* with large concealed punctures. *Tibiæ* tipped with black setæ, third tarsal joint feebly bilobed above, entire be-

neath, fourth as long as three preceding combined. Length from apex of eyes, 7; rostrum, $\frac{3}{4}$; width, $2\frac{3}{5}$ mm.

Hab.—N.S.W.: Windsor.

The tubercles at apex of elytra are very distinctive of this species. The eyes are not so widely separated nor concealed as in *Hyphæria assimilis*, and I have preferred on that account to regard it as an *Ethemaia* rather than as a *Hyphæria*. *Hyphæria* and *Medicasta* are founded on very unsatisfactory characters, and I think should be considered as sections of *Ethemaia*. The third tarsal joint in *Ethemaia* is supposed to be bilobed; this is certainly the case with *E. sellata* and *E. angusticollis*, but in a number of others it is feebly bilobed above and entire or almost entire beneath. In *Hyphæria assimilis* it is feebly bilobed above and entire beneath; the ridges over the eyes (as pointed out by Mr. Blackburn) appear to be more satisfactory; *E. curtula* (which I have from Beverley) somewhat resembles *H. assimilis* in this respect, and also as regards the tarsi, and has the eyes forced out, as in that species; and if the two genera are to be recognised it would belong to *Hyphæria*. *Medicasta* is still more unsatisfactory, the species appear to be nothing more than small *Ethemaiæ*.

Ethemaia emarginata, n. sp.

Black; antennæ (funicle darker than scape or club), tibiæ, tarsi, sides and apex of elytra dull red. Densely clothed with muddy-brown scales. A few setæ showing at sides of prothorax, sides and apex of elytra; legs with whitish setæ.

Head and rostrum slightly convex, the outline (in non-abraded specimens) not interrupted by ridges or costæ. Rostrum short, broad, dilating to mandibles. *Prothorax* slightly longer than wide (but apparently transverse), sides at apex oblique, basal two-thirds parallel; a moderately distinct median excavation; densely and strongly punctate, punctures entirely concealed by scales. *Elytra* much wider than prothorax, shoulders oblique, somewhat thickened, apex emarginate; seriate-punctate, punctures large, round, subapproximate, concealed; third and fifth interstices distinctly raised, near summit of posterior declivity with a small tubercle, on summit itself distinctly tuberculate. Abdominal punctures traceable. *Tibiæ* tipped with black setæ; third tarsal joint feebly bilobed above, still more feebly beneath. Length, 5; rostrum, $\frac{2}{3}$; width, 2 mm.

Hab.—Forest Reefs.

The clothing of this species is so dense that all traces of punctures are lost on the prothorax and elytra. It is allied to the preceding species, but the apices of the elytra are very different.

ETHEMAIA VAGANS, n. sp.

Black; antennæ, tibiæ, tarsi, and sides of elytra dull red. Densely clothed with muddy-grey scales, a subquadrate blackish patch on elytra, under surface with obscure blackish patches, femora and tibiæ with feeble blackish rings. Legs with white setæ.

Head flat, scarcely wider than rostrum. Rostrum longer than usual, parallel between eyes and antennæ and tricarinate, apex dilated. *Prothorax* narrow, longer than wide, sides rounded in middle and feebly transversely impressed near base and apex; with a feeble median groove; densely and strongly punctate, punctures distinctly visible. *Elytra* much wider than prothorax, shoulders oblique, subtuberculate; apex rounded; seriate-punctate, punctures large, round, their positions distinctly visible through scales; third and fifth interstices feebly raised, each with two almost obsolete tubercles on disc, the third with a distinct tubercle at summit of posterior declivity, fifth with a smaller one below summit, and a still smaller one before it. *Under surface* with positions of punctures visible. *Legs* longer than usual; femora thickened; tibiæ tipped with black setæ; third tarsal joint distinctly bilobed, fourth slightly shorter than three preceding combined. Length, $5\frac{1}{3}$; rostrum, $1\frac{1}{6}$; width, 2 mm.

Hab.—N.S.W.: Richmond River; W.A.: Newcastle.

Allied to but abundantly distinct from *angusticollis*. From the description of *adusta* it differs in the rostrum having three carinæ (or seven, if the lateral ones are counted), the scutellum not raised, and each elytron with only three tubercles about the posterior declivity.

ETHEMAIA FUNEREA, n. sp.

Black; tarsi, base and apex of tibiæ, dull red. Densely clothed with black scales. Under surface and legs with dingy whitish setæ, rostrum with black setæ.

Head densely and distinctly punctate, flat and wide, a feeble ridge slightly projecting over each eye. Rostrum short, broad, narrower than head, with five longitudinal granulate ridges between eyes and antennæ, apex dilated. *Prothorax* subcylindrical, sides very feebly sinuous, apex as wide as base, with large, coarse punctures, only partially concealed. *Elytra* more than twice the width of prothorax; shoulders square, nontuberculate; seriate-punctate, punctures large, round, appearing small and deep through scales; interstices scarcely alternately raised, summit of posterior declivity with a moderately distinct tubercle on third, second with a much less distinct one, two feeble tubercles before summit, fifth with a small tubercle just before and another just below

summit; apex rounded. *Under surface* with punctures traceable. *Legs* moderately long; femora thickened; third tarsal joint bilobed, fourth shorter than three preceding combined. Length, $3\frac{1}{2}$; rostrum, $\frac{1}{2}$; width, $1\frac{1}{3}$ mm.

Hab.—Swan River.

A small and very distinct species, possibly belonging to *Medicasta*, but I prefer to regard it as an *Ethemaia*.

ETHEMAIA SELLATA, Pasc.

An abundant and widely distributed species. I have taken specimens at Tamworth, Queanbeyan, Hay, and other places in N.S.W., Murray Bridge and Adelaide in S.A., Beverley and Pelsart Island in W.A., and Hobart, Franklin, and Launceston in Tasmania.

The semilunar brown marking on the elytra mentioned by Mr. Pascoe is rarely present, the scales nearly always being of an uniform colour. The size (including rostrum) ranges from $5\frac{3}{4}$ to $9\frac{1}{4}$ mm.

E. ANGUSTICOLLIS, Pasc.

Hab.—Clarence River.

HYPHÆRIA ASSIMILIS, Pasc.

Hab.—Queanbeyan.

A specimen from Wilcannia differs in having a spot of white scales on the apex of prothorax, the scutellum white and connected with the prothoracic spot by a feeble whitish median line; the elytral tubercles are also more densely crowned and with paler scales than on the rest of the surface.

MEDICASTA LEPTOPSOIDES, n. sp.

Black; antennæ, tibiæ, and tarsi obscure red. Densely clothed with muddy-brown or slaty-grey scales, paler on under than on upper surface. Legs with short, whitish setæ.

Head somewhat flattened. Rostrum about twice as wide as long, narrower than head, with traces of about five feeble ridges. *Prothorax* cylindrical, slightly longer than wide, base and apex equal, with large punctures almost concealed by clothing. *Elytra* wider than prothorax, shoulders rounded, sides feebly increasing to near apex; seriate-punctate, punctures large, round, almost concealed; third, fifth, and seventh interstices strongly raised, the third with a distinct tubercle at summit of posterior declivity, fifth with a tubercle just before and another just below summit. Punctures of *under surface* entirely concealed. *Tarsi* with third joint deeply bilobed, fourth slightly shorter than three preceding combined, subtriangularly dilated to apex. Length, $3\frac{2}{5}$; rostrum, $\frac{3}{4}$; width, $1\frac{1}{3}$ mm.

Hab.—W.A.: Pinjarrah.

Two specimens very different in clothing; on one the scales are uniformly muddy brown, on the other brown mottled with slaty or greenish-grey; they bear a strong general resemblance to many species of *Leptops*.

SUB-FAMILY AMYCTERIDES.

Whilst in Sydney recently I examined some of the specimens of this sub-family in the Macleay and Sydney Museums. Unfortunately, the late Sir William Macleay seldom, if ever, designated his type specimens, so that it is impossible to tell (by the label) when the species is named in both museums, which specimens were his types. Mr. Masters, however, tells me that the majority of them are in the Macleay Museum. A number of the species are referred to wrong genera, but I had not sufficient time to spare to go thoroughly into the question. The following notes, however, were made:—

PSALIDURA.

Mr. Masters believes that this genus does not occur in W. Australia, and such is my own conviction. *P. mira* was recorded from the Swan River by Sir William from a specimen so labelled in W. Sharp Macleay's collection. In the Macleay Museum are a number of duplicates of the species, so many that did the species occur in W. Australia I think that Masters, Brewer, Duboulay, or myself should have taken it.

Sir William appears to have regarded the presence of external anal forceps as an essential feature of the male in *Psalidura*. This supposition I am not willing to admit. I believe that the following species referred by him to *Talaurinus* belong to *Psalidura*:—*Penicillatus*, Macl.; *Riverinæ*, Macl.; *exasperatus*, Er.; and the species he has identified as *morbillosus*, Boi., and *tomentosus*, Boi., in all of which the apical segment of the abdomen is largely transversely excavated, and which have (more or less hidden) anal appendages.

TALAURINUS CAMDENENSIS, Macl.

T. Murrumbidgensis, *rudis*, *salebrosus*, and *rugosus*, Macl., all belong to this species, as also do the specimens labelled *Westwoodi*, Sch., in the Macleay Museum.

TALAURINUS EXCAVATUS, Sch.

The specimen so labelled in the Macleay Museum is identical with the one labelled *rugifer*, Boi. The locality, "Swan River," for the latter, is in all probability erroneous. It does not follow, however, that these names are synonymous.

TALAURINUS SIMILLIMUS, Macl., and T. FOVEATUS, Macl.

These names appear to be synonymous.

Sclerorrhinus.

I believe Sir William has made far too many species of this genus from the South Australian specimens he had under examination, not having allowed sufficiently for the variation of elytral tubercles, which often differ on the right and left sides of a specimen.

Sclerorrhinus Adelaidæ, Macl.

S. divaricatus and *nodulosus* at least, and possibly *arenosus* and a number of others, are synonymous.

Sclerorrhinus Waterhousei, Macl.

S. interioris is synonymous.

Sclerorrhinus asper, Macl.

S. sordidus and *acuminatus* are synonymous.

Sclerorrhinus angustus, Macl.

The unique specimen standing under this name in the Macleay Museum is probably a male of *exilis.*

Notonophes.

Mr. Sloane refers but one species (*Cubicorrhynchus cichlodes*) to this genus. The following species should also be referred to it:—*Talaurinus dumosus* and *spinosus*, Macl., and *lemnus* and *pupa*, Pasc. I do not believe, however, that all these names will eventually stand.

Acantholophus convexiusculus, Macl., and Hyborrhynchus Mastersi, Macl.

I have carefully examined the types of the above in the Macleay Museum (and also the specimens so named in the Sydney Museum), and find them identical. The species belongs to the same genus as *Cubicorrhynchus spinicollis*, Macl. does.

Amycterus draco, W. S. Macl.

I have a male specimen (from Killerberrin, W.A.), which, on comparison with the type specimen of this species, appeared to agree with it, except that the prothorax had five tubercles on one side and six on the other side of the middle.

A specimen (probably from the Murchison), which appears to be the female of the species (unknown to both the Macleays), differs in being much larger than the male (34 by 13 mm.), the prothorax more decidedly flattened at the sides, the elytral tubercles much smaller and flattened, and the lateral row (except at apex), almost obsolete; the apex is strongly mucronate (the mucros fully a millimetre in length), thickened, and obtusely granulate (not with a regular series of small

tubercles). The abdomen is not at all punctate, though somewhat rugose in places. The prothorax has four distinct tubercles on each side, the median space between them being wider than in the male.

MOLOCHTUS TIBIALIS, Sloane.

I have received a specimen from the Adelaide Museum (with an Elder Expedition label in Mr. Helms's writing) as this species. Compared with a female of *gagates*, from Geraldton (Champion Bay), it presents the differences mentioned by Mr. Sloane,* but these differences entirely disappear when compared with the male of that species. My specimen also agrees with Mr. Sloane's description, except that the prothoracic granules are setigerous, instead of being, as he describes them, "punctured at apex, but not setigerous." Possibly his specimen was somewhat abraded.

ÆDRIODES HUMERALIS, n. sp.

Entirely black, opaque, with sparse and very minute dingy scales scattered about. Granules with short setæ, muzzle and legs (especially tibiæ) with long black setæ.

Head flattened, impunctate. Rostrum impunctate, with three feeble impressions; apex with a shining subobcordate, slightly concave punctate space, separated by grooves from the rest of the rostrum. *Prothorax* subglobular; apex trisulcate, median sulcus largest and deepest, open behind but not to base, the ridge on each side of it with smaller granules and denser setæ than elsewhere; with rather large, round granules, each of which bears a seta in its middle. *Elytra* at base not as wide as middle of prothorax, but at apical third considerably wider; suddenly declivous near apex; disc with numerous small shining seta bearing granules, sides with very small shining simple granules; third interstice raised, produced at base, about middle thickened and terminated, at summit of posterior declivity with a large tubercle; fifth interstice raised, arched, and considerably produced at base, at summit of posterior declivity dilated into a tubercle rather less than that on third, and less pronounced in character, except when viewed from behind. *Under surface* with a few small punctures; apical segment transversely impressed. *Legs* long and thin. Length, 11; width, 5 mm.

Hab.—W.A.: Mount Barker.

Moderately close to *nodipennis*,† and, like that species, resembling to a certain extent some of the species belonging to *Mythites* and *Sosytelus*.

* T.R.S. S.A., xvi., p. 413.

† This species was recorded from and I have taken it on the Swan River. In the catalogue it appears as coming from South Australia.

ACHERRES GLOBICOLLIS, n. sp.

Black, opaque, with numerous stout black setæ, and with four small but distinct patches of dingy white scales: one on each shoulder and one at some distance behind it: a few small scales on the sides about the middle.

Head feebly wrinkled, a few large punctures below and behind eyes. Rostrum with large punctures, with two strong, coarsely punctured ridges overhanging the eyes and almost united in front. *Prothorax* almost globular, with large, regular, closely set mamilliform tubercles, all of which are concave and supplied with setæ. *Elytra* briefly ovate, much wider than prothorax, not once and one half as long as wide; sides with large punctures or foveæ, towards suture becoming irregular and submamilliform; each with two rows of about five conical tubercles, which become larger and more acute towards and terminate at summit of posterior declivity; an acute posthumeral tubercle. Length, 9; width, $4\frac{2}{3}$ mm.

Hab.—W.A.: Fremantle.

The tubercles at the base of the inner row on each elytron are more round than conical, and are very distinctly punctate; the outer rows consist of five tubercules on one side and six on the other in the type. It differs from *mamillatus* (which I have from Geraldton), in having the rostral crests much stouter and more coarsely punctate, the prothorax more globular and with regular, uniform, more strongly elevated, and smaller mamilliform tubercles; the elytra are supplied with larger punctures, with larger and less numerous tubercles, and the clothing is different.

ODITESUS TIBIALIS, n. sp.

Entirely black, opaque, with small setose greyish scales, moderately dense on head, prothorax, and sides of elytra, and causing the upper surface to appear very dingy. Granules with small, the legs with long, black setæ; middle almost to apex of anterior tibiæ with a very dense fringe of setæ.

Head largely excavated, a feeble median ridge on each side between eyes. Rostrum sparsely punctate; base with a large subconical elevation, which is feebly divided along its middle, and punctate and setose throughout. *Prothorax* subglobose, with a distinct (but not deep), complete median excavation, each side in front with an oblique excavation, with large (larger at sides than in middle), round granules, each of which is punctured and bears a seta. *Elytra* at base not much wider than prothorax in middle, but considerably wider towards apex; with series of punctures much interrupted on disc, but becoming more regular and foveate on flanks; third and fifth interstices more or less raised, the elevated parts densely granulate, both (third slightly, fifth largely) pro-

duced at base on to prothorax, third with three or four (in the specimen under observation three on the right and four on the left elytron) clusters of granules forming feeble tubercles and a distinct tubercle at summit of posterior declivity. *Under surface* and *legs* with dense, shallow, slightly rugose punctures; apical segment transversely impressed. *Legs* long and thin. Length, 9; width, 4⅙ mm.

Hab.—W.A.: Mount Barker.

To the naked eye the fringe of setæ cause the tibiæ to appear strongly bisinuate beneath. The excavation on each side of the median one in front of the prothorax is very distinct when seen from in front, but indistinct when viewed from behind. From some directions each elytron appears to be supplied with four distinct tubercles, but the only real tubercles are those at the summit of the posterior declivity, the others being little more than clusters of granules—except perhaps the one on the middle of the fifth interstice. The species is very distinct from *lycosarius* (the only described species with which I am acquainted) and much resembles *Ædriodes nodipennis.* There are two other species in my possession, but each is represented by a single battered specimen.

SUB-FAMILY RHYPAROSOMIDES.

Phrynixus astutus, Pasc.

When in Melbourne recently I received from the National Museum a specimen of this New Zealand species, as coming from Victoria.

Zephryne personata, n. sp.

Very densely clothed with muddy-greyish scales entirely concealing the punctures and derm. With straggling semi-erect setæ; dark on upper surface both of body and legs, and pale on under surface of body and legs.

Head apparently shallowly concave in middle, with a lateral extension completely concealing each eye from above. *Prothorax* feebly transverse, disc and sides very uneven, apex feebly produced, but not elevated. *Elytra* wider than prothorax, shoulders produced and subtuberculate, alternate interstices distinctly raised. Length, 3⅖; width, 1½ mm.

Hab.—N.S.W.: Glen Innes.

Having only one specimen under examination I have not cared to abrade the scales to make sure of the sculpture, except on a portion of the elytra, which is seen to be covered by very large quadrate punctures. The species differs from the description of *sordida* in being smaller, by having the prothorax not at all oblong, and by having the alternate interstices of the elytra (although distinctly raised) entirely without tubercles.

MANDALOTUS CAMPYLOCNEMIS, n. sp.

Black; antennæ and tarsi of a dingy red. Densely clothed with muddy scales, entirely concealing the derm, and mixed here and there with a few stout semi-upright clavate setæ. Under surface less densely clothed than upper, and with more numerous and stouter adpressed setæ. Legs with numerous elongate setæ, the intermediate tibiæ in the male with long, thin hair towards apex.

Rostrum somewhat curved, strongly carinate, the carina sometimes almost concealed. Scape straight except at extreme base. First joint of funicle slightly longer than second. *Prothorax* strongly transverse, apex considerably narrower than base, median groove very distinct, with numerous obtuse tubercles in male, in the female slightly irregular and with small, scattered granules; very feebly punctate. *Scutellum* small and indistinct. *Elytra* subcordate; at base narrower, about the middle wider than prothorax; seriate-punctate, the punctures rather large and round, and showing almost as geminate striæ through clothing; suture beyond middle, second, fourth, and sixth interstices obtusely tuberculate, the second and sixth at base distinctly tuberculate, a distinct tubercle about shoulder. *Tibiæ* strongly curved in front, dilated at apex, less noticeably so in female than in male, and in the intermediate than the others. Length, $6\frac{1}{2}$ (incl. rost.); width, $2\frac{2}{3}$; variation in length, $4\frac{1}{2}$-$7\frac{1}{2}$ mm.

Hab.—Clarence River.

The curvature of the apical portion of the anterior tibiæ in the male is so great as to be almost at right angles to the base, and is much greater than in *valgus*, which species it somewhat resembles. In the male the basal segment of the abdomen is strongly transversely depressed, in the female the depression is scarcely traceable.

NOTE.—The colour of the above and of nearly all of the following species can only be seen after the scales have been abraded. When the punctures and granules or tubercles of the prothorax and elytra are described without mentioning the clothing, such description has been drawn up from intentionally abraded specimens.

MANDALOTUS PILIVENTRIS, n. sp.

Black; antennæ and tarsi of a dingy red. Densely clothed with muddy scales which entirely conceal the derm, and with numerous stout setæ, more numerous and depressed on prothorax, on elytra sublinear in arrangement and suberect. Legs with stout setæ, the anterior and to a slightly less extent the posterior tibiæ in the male fringed beneath with long, soft hair.

Rostrum stout, curved, strongly carinate along middle, the carina sometimes concealed. Scape straight, not very stout; two basal joints of funicle subequal. *Prothorax* dilated in middle, apex slightly narrower than base, median line feeble; with small regular obtuse tubercles, neither tubercles nor median line showing through clothing. *Scutellum* small and indistinct. *Elytra* in male narrower than prothorax at base, and wider beyond middle; in female as wide at base and slightly increasing to beyond middle; seriate-punctate, punctures moderately large, round, and regular, the interspaces densely punctate, finer punctures entirely concealed; suture, second, fourth, and sixth interstices slightly raised. *Tibiæ* moderately strongly curved, and all (the intermediate less noticeably than the others) dilated at apex. Length, 6; width, 2½; variation in length, 5-7 mm.

Hab.—N.S.W.: Clarence River, Windsor, Sydney.

The basal segment of the abdomen in the male is strongly depressed, and clothed with long setæ between the coxæ, in the female it is but feebly depressed and the clothing is normal; the sutural interstice is slightly contracted near the base, but dilates beyond the middle, so that the rows of punctures appear to be somewhat curved. Numerous specimens of both this and the preceding specimens were obtained during a flood. Although the sculpture of abraded specimens is seen to be very different, perfect specimens are not very dissimilar, but they are readily distinguished by the clothing and shape of the tibiæ.

Mandalotus scaber, n. sp.

Male. Black; antennæ and legs dull red, tarsi pale red. Clothing as in the preceding species, except that the tibiæ are not clothed beneath with long hair.

Rostrum stout, curved, carinate. Scape thinner than in the preceding species and slightly curved, two basal joints of funicle subequal. *Prothorax* strongly transverse, apex distinctly narrower than base; median line distinct, with numerous obtuse tubercles, and which are traceable through clothing. *Scutellum* small and very indistinct. *Elytra* ovate, small, considerably narrower than prothorax at base, and nowhere as wide as prothorax at its widest; base semicircularly emarginate; seriate-punctate, the punctures moderately large; each with a few obtuse tubercles, of which the most distinct are on the second and sixth interstices at base and one behind each shoulder. Basal segment of *abdomen* widely depressed, the depression continued from metasternum. All the *tibiæ* strongly curved and dilated at apex, the posterior suddenly narrowed close to apex. Length, 5; width, 2 mm.

Hab.—Tweed River.

A small species somewhat resembling *campylocnemis* and *valgus*, from both of which it may be readily distinguished by its large prothorax and small elytra.

MANDALOTUS AMPLICOLLIS, n. sp.

Male. Black; antennæ and tarsi of a dingy red. Very densely clothed with muddy-brown scales, not only concealing the derm, but even the positions of the punctures. Prothorax with stout, suberect setæ, on the elytra becoming sublinear in arrangement. All the tibiæ fringed beneath with long, soft hair, but rather sparser on the anterior than on the four posterior.

Rostrum stout, distinctly curved, non-carinate; scrobes deep. Scape stout, shorter than usual. First joint of funicle once and one half the length of second. *Prothorax* large, much less transverse than usual, sides rounded, apex scarcely narrower than base; densely punctate, with small, regular, seta-crowned granules, median line just traceable through clothing. *Scutellum* not visible. *Elytra* comparatively small, almost the width of prothorax at base, and scarcely wider elsewhere; seriate-punctate, punctures rather large and round; interspaces finely punctate, alternate interstices raised. Basal segment of *abdomen* widely depressed, the depression continued on to second segment, but small, and bounded behind by a distinct ridge. *Tibiæ* stouter than usual, strongly curved, apex of the anterior so strongly curved as to be almost drawn backwards. Length, 6; width, $2\frac{1}{2}$ mm.

Hab.—Forest Reefs.

The scape is shorter than in any other species with which I am acquainted. The clothing is so dense that the sculpture is entirely hidden; many of the suberect setæ on the elytra are more like stout, soft scales than true setæ. The rostrum is dilated at the middle and non-carinate, the apical plate being abruptly terminated.

MANDALOTUS SPURCUS, n. sp.

Blackish; antennæ and tarsi of a dingy red. Moderately densely clothed with muddy scales mixed with a few setæ. Anterior tibiæ in the male rather feebly fringed beneath with long, soft hair.

Rostrum stout, curved, narrowly carinate, the carina sometimes almost concealed. Scape almost straight; first joint of funicle slightly longer and noticeably thicker than second; club larger than usual. *Prothorax* moderately transverse, sides rather feebly rounded, apex as wide as base, median line feeble, disc almost smooth. *Scutellum*

small, not traceable through clothing. *Elytra* oblong-ovate, in both sexes wider than prothorax, widest in female: seriate-punctate, punctures round and close together; alternate interstices scarcely visibly raised; a feeble tubercular elevation behind each shoulder. *Tibiæ* rather stout, not strongly curved, bisinuate beneath, not very wide at apex. Length, 5; width, 2 mm.

Hab.— N.S.W.: Sydney, Windsor.

The very obtuse tubercular elevations of the prothorax and the feeble median line are entirely concealed by the not very dense clothing; the elytral punctures are rather larger than usual. The female is considerably wider than the male, but otherwise the sexual differences are not very pronounced.

MANDALOTUS EXCAVATUS, n. sp.

Male. Blackish; antennæ and tibiæ of a dingy red. Densely clothed with dark muddy scales, interspersed with stout setæ. Legs with stout setæ, the tibiæ not fringed beneath with long hair.

Rostrum moderately long, narrowly carinate. Scape rather stout; first joint of funicle almost twice the length of second. *Prothorax* and *elytra* much as in the preceding, but the tubercular elevations of the prothorax very distinct and regular. Basal segment of *abdomen* strongly depressed in middle, the depression bounded at each corner by a distinct ridge. *Tibiæ* much as in the preceding, but thinner. Lengtn, 4; width, $1\frac{2}{3}$ mm.

Hab.—Brisbane (A. J. Coates).

MANDALOTUS SUTURALIS, n. sp.

Blackish; antennæ, tarsi, and suture of elytra of a dingy red. Not very densely clothed with small, rounded scales and with numerous stout setæ, on the elytra becoming linear in arrangement, and very conspicuous on the suture and alternate interstices. Legs setose, the anterior tibiæ of male rather sparsely fringed beneath with moderately long hair.

Rostrum moderately stout, curved, strongly carinate. Scape straight and moderately stout; first joint of funicle noticeably longer and stouter than second. *Prothorax* slightly transverse, sides moderately round, base and apex almost equal, with small, closely packed, rounded, and regular tubercles; median line just traceable either on perfect or abraded specimens. *Scutellum* small, transverse, indistinct. *Elytra* oblong-ovate; in male scarcely, in female distinctly wider than prothorax; seriate-punctate, the punctures comparatively small and round, appearing in geminate rows through clothing; alternate interstices scarcely visibly raised, but slightly wider than the others. *Abdomen* transversely

wrinkled or corrugated in male, the basal segment narrowly impressed across base and across middle of apex. *Tibiæ* curved, bisinuate beneath, not largely dilated at apex. Length, 4½; width, 1⅔ mm.

Hab.—N.S.W.: Armidale, Inverell.

The colour of the elytral suture is sometimes traceable without removal of scales, but when these have been abraded it shows up very distinctly. The small and regular prothoracic tubercles are very distinctive.

Mandalotus pinguis, n. sp.

Blackish; antennæ and legs obscure reddish-brown, tarsi paler. Not very densely clothed with small, round, grey scales (in certain lights having a golden-green reflection) obscurely mottled with small brown patches. With numerous stout setæ, conspicuous but scarcely linear in arrangement; at the sides (especially of the elytra) becoming rather long and resembling the clothing of the legs; this is thin and straggling, and scarcely longer on the tibiæ than elsewhere.

Rostrum short, stout, curved, non-carinate. Scape almost straight, stout at apex; first joint of funicle obtriangular, as long as the two following combined. *Prothorax* feebly transverse, rather strongly rounded; densely and finely punctate; without tubercular elevations and without median line. *Scutellum* not traceable. *Elytra* subovate, distinctly wider than prothorax, widest before middle; shoulders rounded; seriate-punctate, punctures small and close together; interstices wide, regular, and flat. Two basal segments of *abdomen* strongly punctate, the others with denser and smaller punctures. *Tibiæ* almost straight on their outer edges, all (but especially the posterior) large at apex. Length, 5⅔; width, 2⅔ mm.

Hab.—Rottnest Island.

A rather short, stout species, without rostral carina; from *ventralis* it may be distinguished by the absence of prothoracic tubercles, from *punctiventris* by having no median line, and from *pilosus*, to which it is closest, by the shorter and sparser clothing, less strongly curved tibiæ, wider elytral interstices, and smaller punctures.

Mandalotus pallidus, n. sp.

Testaceous, under surface livid. Not very densely clothed with obscure muddy scales. With numerous moderately long, suberect setæ, darker and more numerous on the prothorax than on the elytra, on the latter they are sublinear in arrangement; tibiæ in male fringed beneath with long, soft hair, less noticeable on the intermediate than on the others.

Rostrum short, curved, distinctly carinate. Scape straight, increasing to apex; two basal joints of funicle elongate, the first longer and stouter than second. *Prothorax* widely transverse, apex noticeably narrower than base; disc smooth and without tubercular elevations; median line narrow, as distinct before as after removal of scales. *Scutellum* small, but distinct. *Elytra* in male scarcely, in female considerably wider than prothorax; seriate-punctate, punctures moderately large and round (smaller in female than in male); interstices feebly convex, the alternate ones feebly raised. Basal segment of *abdomen* with a semi-circular row of strong punctures. *Tibiæ* slightly curved, bisinuate beneath, moderately dilated at apex. Length, $5\frac{1}{2}$; width, male 2, female $2\frac{2}{3}$ mm.

Hab.—Sydney.

Had I seen but one specimen I would probably have considered it immature, but as there are fourteen under examination, all agreeing in colour, I have no doubt but that the colour as described is that of fully matured specimens. The species is not very close to any here noticed or described.

Mandalotus reticulatus, n. sp.

Blackish; antennæ, prothorax, tarsi, and base of tibiæ dull reddish-brown. Sparsely clothed with small rounded scales. The elytra with very distinct but not numerous setæ. Tibiæ moderately densely setose, but scarcely fringed beneath.

Rostrum moderately stout, curved, acutely carinate. Scape slightly but distinctly curved; first joint of funicle almost twice the length of second. *Prothorax* moderately transverse, base and apex subequal, closely covered with small and very depressed but distinct tubercles; median line not at all traceable. *Scutellum* small, moderately distinct. *Elytra* oblong-ovate, not much wider than prothorax; seriate-punctate, punctures not very large; interstices regular and finely punctate. Basal segment of *abdomen* with a semicircular row of strong punctures. *Tibiæ* curved, the intermediate bisinuate beneath, the posterior curved outwards on apical half. Length, 3; width, $1\frac{1}{4}$ mm.

Hab.—Inverell.

The prothorax appears as if the elevations were less like tubercles than owing to numerous narrow impressions, in this respect differing esentially from those of *suturalis*. The curvature of the posterior tibiæ is remarkable.

Mandalotus pusillus, n. sp.

Male. Blackish; antennæ, prothorax, tarsi, tibiæ, and base of femora obscure reddish-brown. Sparsely clothed with

small, ochreous-grey scales. With stout, dark, suberect setæ on the elytra, really linear in arrangement, but scarcely appearing to be so when viewed directly from above. Under surface sparsely and almost uniformly setose. All the tibiæ (but the intermediate less noticeably so) fringed beneath with long, soft hair, rather sparser and longer than is usual.

Rostrum moderately stout, not depressed at base, and non-carinate. Scape comparatively thin, very feebly curved; first joint of funicle about once and one half the length of second. *Prothorax* transverse, rounded, somewhat depressed, smooth; finely punctate, and with a feeble median line. *Scutellum* small. *Elytra* not much wider than prothorax, widest near base; seriate-punctate, punctures rather large and subquadrate: interstices feebly convex, and very feebly alternately raised. Basal segment of *abdomen* with a semicircular row of strong punctures, the second with a few scattered large punctures, apical segment densely and finely punctate. *Tibiæ* strongly curved, suddenly at apex of posterior. Length, 3; width, 1¼ mm.

Hab.—Swan River.

Somewhat resembles *suturalis* and the preceding, but may be at once distinguished by its smooth prothorax. The eyes are rather more coarsely faceted and more advanced in position than usual. On the specimen described both of the deciduous mandibular processes are present, they are curved, directed outwards, and but slightly decrease in width to apex, their colour is red with the tip blackish.

MANDALOTUS SUBGLABER, n. sp.

Black, somewhat shining; antennæ (the club black), tarsi, and base of tibiæ dull reddish brown. Sparsely clothed with very small grey scales, and with subdepressed and not very stout setæ. Tibiæ very feebly fringed beneath.

Rostrum moderately stout, not depressed at base, distinctly costate. Scape almost straight, rather suddenly thickened near apex; first joint of funicle obtriangular, twice as long as second. *Prothorax* transverse, closely covered with small, flattened tubercles; median line narrow and indistinct. *Scutellum* scarcely traceable. *Elytra* oblong-ovate, in male scarcely, in female distinctly wider than prothorax; seriate-punctate, punctures large and subquadrate; interstices convex and regular. Basal segment of *abdomen* depressed in middle, the depression continued on to second segment and to metasternum. Anterior *coxæ* almost approximate; tibiæ rather feebly curved and feebly bisinuate beneath. Length, 4; width, 1⅔ mm.

Hab.—Forest Reefs.

A small, shining species which may be easily distinguished by the colour of the antennæ.

Timareta.

This genus is remarkably close to *Mandalotus*, being separated therefrom only by the character of the ungues.

Timareta figurata, Pasc.

This species (which I have from Geraldton, Bunbury, Swan River, and Rottnest Island) occurs (as also does *T. crinita)* in abundance at the roots of beach-growing plants. The white scales are exceedingly variable in disposition and extent, and are frequently tinged with a pretty green; on some specimens the whole of the scales are of a pale, muddy green, in others they are more or less coppery; the second abdominal segment is usually clothed with greenish scales. *T. satellina*, Pasc., I have no doubt whatever, is only one of its numerous varieties.

T. crinita, Pasc.

Hab.—Geraldton, Swan River.

SUB-FAMILY TANYRHYNCHIDES.

Xynæa uniformis, n. sp.

Black; antennæ, tarsi, and apex of rostrum feebly diluted with red. Densely clothed all over (except at the sides and apical third of rostrum) with dingy greyish and somewhat rounded scales, perfectly uniform in tint, except that those of the under surface are slightly paler. With somewhat stout, depressed setæ at regular intervals, but less numerous on under surface and elytra than elsewhere.

Rostrum the length of prothorax, basal half convex and ridged, the ridge continued to apex, but the rostrum in front of the antennæ somewhat concave. Scape lightly curved. *Prothorax* large, transverse, sides rounded, base feebly rounded, apex more than half the width of base; with rather dense and large punctures, the interspaces finely punctate, with a feeble median line; neither line nor punctures traceable through clothing. *Elytra* in male narrower at base than widest part of prothorax, in female as wide; widest at about one-third from base, regularly convex, conjointly rounded at apex, posterior declivity rather abrupt, seriate-punctate, punctures moderately large and round; interstices flat, considerably wider than punctures, themselves rather densely punctate, but the punctures concealed. *Under surface* and legs densely punctate. Basal segment of *abdomen* almost as long as three following combined; apical segment feebly depressed in male, gently convex in female. *Tibiæ* with a few small teeth beneath, all at apex crowned with stiff black setæ most noticeable on the posterior. Length, male 3; rostrum, $1\frac{1}{3}$; width, $1\frac{3}{4}$ m.

Hab.—King's Sound (W. W. Froggatt).

In four specimens under examination, two (which I regard as males) differ from the others in being smaller, with larger prothorax, smaller elytra, and with somewhat different abdomen; one of them has the derm almost entirely of a dull red colour.

X. SAGINATA, Pasc. Hab.—S. Australia.

SYNAPTONYX OVATUS, Waterh. *Hab.*—N.W. Australia.

SUB-FAMILY ATERPIDES.

PELORORRHINUS AMPLIPENNIS, n. sp.

Moderately densely clothed with obscure greyish, feebly mottled with sooty and brown scales, but nowhere forming a distinct pattern. Prothoracic punctures with stout scales becoming setose in middle. Rostrum clothed throughout, the apex with long bristles; apices of all the joints of the funicle with long setæ; tarsi with long setæ, especially noticeable on the claw joints.

Head densely and in front deeply punctate; a feeble ridge (conjoined and slightly raised in front) on each side between eyes. Rostrum largely excavated in front, near base with a narrow transverse ridge, behind which is a slightly concave space; flanks coarsely and confluently punctate to base, finely in front except on upper portion, which is almost impunctate. Club elongate-ovate, longer than three preceding joints combined. *Prothorax* longer than wide (4 x $3\frac{2}{3}$ mm.), sides slightly dilated in middle, base not much wider than apex; with numerous small granules not very clearly seen through clothing. *Elytra* raised above and fully twice the width and four times the length of prothorax, sides very feebly diminishing from near base, and not suddenly rounded at apex; with regular series of large, shallow, quadrate punctures; interstices feebly raised, very much narrower than punctures, with almost obsolete granules, except for a few moderately distinct ones near base and suture. Length, 18; width, $6\frac{1}{3}$ mm.

Hab.—W.A.: Mount Barker (Macsorley and Lea).

To the naked eye the prothorax appears to be marked by two dusky, longitudinal, slightly curved lines. If *Pelororrhinus* is to be maintained it may be necessary to erect a genus to receive this species and *angustatus*, and another to receive the species described below as *Rhinaria aberrans*.

P. CRASSUS, Blackb. *Hab.*—S. Australia.

P. SPARSUS, Germ. *Hab.*—S. Australia.

P. ANGUSTATUS, Fahrs. *Hab.*—Swan River.

RHINARIA CAUDATA, n. sp.

Densely clothed with small scales, varying from ashen grey to dingy black; prothorax with a feeble median line and several small spots of pale scales; elytra with three dark, oblique fasciæ: a narrow one at base (commencing on shoulders), a wide one (very indistinct towards suture) about middle, and an indistinct one near apex. Rostrum glabrous except for a few bristles at apex.

Head densely punctate, punctures confluent in front and causing numerous short ridges to appear; crests strongly curved, conjoined in front. Rostrum gently concave; flanks coarsely and irregularly punctate. Club shorter than three apical joints of funicle, the apical joint of the latter with a little of the club's sensitised pubescence. *Prothorax* densely punctate, each puncture containing a small shining granule, each of which is punctured in middle. *Elytra* suddenly and largely narrowed at apical fourth, each separately produced at apex; seriate-punctate, punctures large, subquadrate; interstices narrower than punctures, third, fifth, and seventh distinctly raised; at base and sides with small, shining, reddish granules. *Under surface* with moderately dense, large, round, and deep punctures. Length, $10\frac{1}{2}$; width, $4\frac{1}{6}$; variation in length, $10\frac{1}{2}$-12 mm.

Hab.—N.S.W.: Riverstone (Miss King), Galston (S. Dumbrell).

A very distinct species. Many of the abdominal and a few of the sternal punctures do not bear scales or setæ. On one of the specimens the elytral granules are almost black, and the scales are so dense as entirely to conceal the punctures of the upper surface.

RHINARIA CONCAVIROSTRIS, n. sp.

Densely clothed with scales varying from ashen grey (pale on under surface and legs) to dingy brown or black; frontal crests pale ochreous; prothorax with three feeble longitudinal stripes of pale scales; elytra with the pale scales covering the majority of the surface; the dark scales forming a wide fascia beyond middle (narrowed towards suture) and somewhat blotchily distributed towards base and apex; scutellum with white scales. Punctures of prothorax and elytra with larger spathulate scales, becoming setose in middle of the former. Rostrum glabrous.

Head with dense punctures which are partially confluent in front, crests moderately large, feebly curved, narrowly but distinctly separated throughout. Rostrum feebly concave; base considerably elevated; flanks not very coarsely but irregularly punctate. Club slightly longer than three preceding joints combined. *Prothorax* with large round

punctures slightly confluent in places. *Elytra* with regular series of large subquadrate punctures; interstices regular, each with a regular row of shining dark granules, larger and more flattened towards base than apex. Punctures of *under surface* much as in the preceding, but each bearing a seta. Length, $9\frac{1}{2}$; width, 4; variation in length, $9\frac{1}{2}$-13 mm.

Hab.—Q.: Upper Endeavour River (C. French), Port Denison (G. Masters).

The prothoracic punctures are so large that their walls are broken in places and cause the surface to appear to be covered with granules; this appearance is visible in many other species of the genus.

RHINARIA SULCIROSTRIS, n. sp.

Densely clothed with pale ochreous-brown scales, in places feebly variegated with paler or darker scales; prothorax with a feeble and indistinct pale median line, and numerous spots transversely placed in middle; under surface and legs scarcely paler than upper. Prothorax with dense suberect scales in punctures, becoming subsetose towards middle; elytral punctures with stout scales; the interstices, in addition to the ordinary scales, each with a row of stout, pale, decumbent scales, almost as large as (but narrower than) those in punctures. Rostrum sparsely clothed in middle, the apex with sparse, stout bristles.

Head very densely punctate; crests curved, moderately large, joined in front. Rostrum slightly concave, feebly transversely wrinkled at base; flanks very coarsely and irregularly punctate, towards apex and top scarcely punctate, sulcate towards bottom. Club elongate-elliptic, slightly longer than four preceding joints combined. *Prothorax* with dense round punctures, the walls of which are of unequal thicknesses, and cause the surface to appear to be granulate. *Elytra* with regular series of large, subquadrate punctures; interstices regular, with small granules towards base. Punctures of *under surface* each bearing a large, stout scale, except that on the apical segments they become setose. Length, 12; width, $4\frac{3}{4}$; variation in length, $10\frac{1}{2}$-12 mm.

Hab.—W.A.: Mount Barker (R. Helms and S. Macsorley)

The very long club is this species' most distinctive feature; the eyes are less ovate than in *stellio.*

RHINARIA BISULCATA, n. sp.

Densely clothed with pale, soft, ochreous-brown and very pale yellow scales, the whole having a soft, speckled appearance. Prothorax and elytra with the usual stout scales. Rostrum both on flanks and along middle with distinct setose scales or setæ.

Head with dense, but concealed, punctures; crests large, moderately curved, feebly separated (on one specimen connected in front) throughout. Rostrum decidedly concave; base ridged; flanks coarsely and irregularly punctate; lower portion narrowly bisulcate. Funicle with the second joint much shorter than the first; club moderately long, ovate. *Prothorax* with numerous black, glossy granules, showing through clothing. *Elytra* with series of large, quadrate punctures; interstices regular, much narrower than punctures, each with a regular row of piceous-red granules, very distinct throughout, but small towards apex. Punctures of *under surface* rather less numerous than usual, each (except of apical segments of abdomen which are setose) bearing a rather stout scale; metasternal episterna each with a single row. Length, 8½; width, 3½; variation in length, 8½-10 mm.

Hab.—N.Q.: Upper Endeavour River (C. French); N.S.W.: Sydney (Lea).

The two grooves of the lower portion of the flanks of the rostrum are sometimes obscured by clothing. The club is more elongate than in *cavirostris;* the second joint of funicle, much shorter than the first, separates it from the description of *debilis.*

RHINARIA FAVOSA, n. sp.

Not densely clothed with dingy scales; prothoracic and elytral punctures with stout scales; elytral interstices with regular series of stout scales. Rostrum glabrous.

Head densely punctate, punctures slightly confluent in front; crests not very large, feebly curved, not united in front. Rostrum convex, but at extreme base feebly concave, and with a median ridge which divides the crests; flanks with a few small punctures towards base. Club elongate-ovate. *Prothorax* feebly flattened in middle, with dense, round, clearly cut, non-confluent punctures; the surface nowhere granulate. *Elytra* with regular series of large subquadrate punctures; interstices regular, each with a regular row of rather large, flattened, glossy, reddish granules, becoming smaller and convex towards apex. Punctures of *under surface* rather denser than usual, each (especially on sterna) bearing a large scale. Length, 9; width, 3½ mm.

Hab.—W.A.: Geraldton.

The clothing on the unique specimen under observation is perhaps somewhat abraded, but the species (on account of the prothoracic punctures) is a very distinct one.

RHINARIA TRAGOCEPHALA, n. sp.

Moderately densely clothed with dingy scales, nowhere forming a distinct pattern, but darker on prothorax than on

elytra; scutellum with whitish scales; under surface and legs with dingy greyish scales. Prothoracic and elytral punctures and interstices of the latter towards apex with stout scales. Rostrum glabrous.

Head densely punctate; crests very large, in front with three very distinct raised shining processes: the median one largest and subcordate, the two others at the sides and slightly to the rear, and subcylindric or subconical. Rostrum convex; flanks moderately regularly punctate, except that the punctures increase in size to (although not very large at) base. Club ovate, noticeably shorter than three preceding joints combined. *Prothorax* with large round punctures, the walls of which are frequently absent in places, and cause rather large granules to appear; middle sometimes with a short, irregular carina. *Elytra* with series of large subquadrate punctures; interstices regular, much narrower than punctures, each with a regular row of glossy, reddish granules, distinct to, but very small at, apex. *Under surface* with dense punctures, each of which (except on apical segments of abdomen) bears a stout scale. Length, 11½; width, 4¼; variation in length, 8-12 mm.

Hab.—Q.: Upper Endeavour River, Somerset (C. French), Gayndah (G. Masters); W.A.: Geraldton (Lea).

The three very distinct processes marking the front of the very large crests render this species remarkably distinct; from in front they cause the head (including the rostrum) to look remarkably like that of a goat.

Rhinaria simulans, n. sp.

Densely clothed with dingy scales, on the elytra obscurely mottled with small sooty patches; scutellum with whitish scales. Prothoracic punctures and elytral punctures and interstices (the latter much more distinctly than usual) with stout scales. Rostrum glabrous.

Head densely punctate; crests very large, each side in front with a raised, moderately shining process. Rostrum convex, even at base; extreme base on each side with a narrow extension; flanks finely and regularly punctate except at base, where the punctures are more crowded. Club ovate, no longer than two preceding joints. *Prothorax*, *elytra*, and *under surface* as in the preceding species, except that the granules are smaller and those on the elytra darker. Length, 11½; width, 4 mm.

Hab.—N.S.W.: Queanbeyan.

A very distinct species; the frontal crests are scarcely as large as in the preceding species, the processes are only two in number, and are partially obscured by clothing.

Rhinaria aberrans, n. sp.

Upper surface sparsely, legs moderately, under surface densely clothed with whitish scales. Prothoracic punctures with indistinct larger scales. Rostrum glabrous.

Head densely punctate; crests entirely absent, but a feeble longitudinal impression between eyes. Rostrum strongly convex, base not raised above the rest, but thickened between eyes; flanks rather strongly but not densely punctate. Funicle with the second joint as long as scape and slightly longer than first; club elongate-ovate, much stouter than funicle, longer than three preceding joints combined. *Prothorax* with small granules, sides with rounded punctures. *Elytra* with series of large quadrate punctures, interstices regular or feebly alternately raised, much narrower than punctures; not granulate. Punctures of *under surface* more or less concealed, but apparently large and scale or seta bearing. Claw joint rather stouter, the claws smaller than usual. Length, 6; width, 2 $\frac{1}{5}$; variation in length, 4½-6 mm.

Hab.—W.A.: Mount Barker (R. Helms).

A very small species. The absence of frontal crests, the long second joint of funicle, and the great (proportionate) width of the club are at variance with the other species belonging to *Rhinaria*. Of four specimens under examination three appear to be partially abraded, but one I believe to be in perfect preservation.

Rhinaria convexirostris, n. sp.

Densely clothed with greyish or very pale brown scales, paler on scutellum, under surface, and legs than elsewhere; the elytra with a distinct blackish fascia beyond middle, which is narrowed, and more or less interrupted towards suture. Prothoracic and elytral punctures with larger scales. Rostrum glabrous.

Head densely punctate; crests moderately large, feebly curved, indistinctly united in front. Rostrum convex; flanks irregularly, but not coarsely or densely, punctate. Club elongate-ovate, slightly longer than three preceding joints combined. *Prothorax* with large round punctures, the walls of which are frequently broken so as to cause glossy depressed granules to appear. *Elytra* with series of moderately large and somewhat rounded punctures; interstices regular, much narrower than punctures, each with a row of reddish, glossy granules, which become very small towards apex. *Under surface* densely punctate, each puncture bearing a more or less setose scale, those on the sterna being scarcely stouter than on the abdomen. Length, 9; width, 4 (vix.); variation in length, 8½-10 mm.

Hab.—S.A.: Venus Bay (C. French).

Remarkably close in general appearance to *concavirostris*, but at once distinguished by the rostrum. The elytral granules are not constant, as of three specimens under examination, two have them convex throughout. whilst the third has them depressed and larger towards base.

RHINARIA SIGNIFERA, Pasc.

Mr. C. French has sent me a number of specimens from North Queensland (Cooktown, Somerset, and Upper Endeavour River), which agree exactly with Mr. Pascoe's description of this species. They vary in length from 4½ to 6 lines.

RHINARIA CAVIROSTRIS, Pasc.

A very variable species as regards size and markings. I have specimens from Victoria River (Mitchell's expedition), Brisbane (A. J. Coates), and Whitton, Tamworth, and Clarence River.

RHINARIA STELLIO, Pasc.

This handsome species may frequently be seen on young shoots and leaves of various species of *Banksia*. When alive they are frequently marked with small patches of ochreous scales, but these become almost obsolete in spirits. I have specimens (from Albany, Swan River, and Pinjarrah) varying in length from 12 to 21 mm.

R. TIBIALIS, Blackb.	*Hab.*—N.S.W.: Sydney, Galston, Forest Reefs, Cootamundra.
R. RUGOSA, Boi.*	*Hab.*—Sydney.
R. TRANSVERSA, Boi.*	*Hab.*—Sydney, Forest Reefs.
R. GRANULOSA, Fahrs.	*Hab.*—N.S.W.: Wallerawang.
R. TESSELATA, Pasc.	*Hab.*—Swan River.
R. CALIGINOSA, Pasc.	*Hab.*—N.S.W.: Bungendore.

Rostrum concave along middle.
- Elytra suddenly narrowed towards and separately produced at apex ... *caudata*, n. sp.
- Elytra gently arcuate towards and conjointly rounded at apex.
  - Rostrum glabrous along middle ... *concavirostris*, n. sp.
  - Rostrum more or less distinctly setose or squamose along middle.
    - Interstices of elytra alternately raised ... ... *transversa*, Boi.
    - Interstices regular.
      - Elytra with a distinct white transverse complete fascia near middle ... ... *signifera*, Pasc.

* I am doubtful as to whether these species are correctly identified or not, but they are so named in the Macleay and Sydney Museums.

Elytra non-fasciate
Club elongate-elliptic.
Interstices of elytra with regular and very distinct shining granules ... *stellio*, Pasc.
Interstices very feebly granulate and only towards base ... ... *sulcirostris*, n. sp.
Club ovate.
Elytral granules more or less concealed ... ... *cavirostris*, Pasc.
Elytral granules distinct throughout ... ... *bisulcata*, n. sp.
Rostrum convex in middle.*
Disc of prothorax with clearly defined, non-confluent punctures ... ... *favosa*, n. sp.
Prothorax granulate, or if punctate then punctures decidedly confluent.
Frontal crests with three raised shining processes (one in front and one each side) ... ... *tragocephala*, n. sp.
Frontal crests with two raised processes (one on each side) ... *simulans*, n. sp.
Frontal crests absent ... ... *aberrans*, n. sp.
Frontal crests without raised processes.
Interstices of elytra alternately raised.
Flanks of rostrum setose ... *granulosa*, Fahrs.
Flanks of rostrum glabrous ... *calignosa*, Pasc.
Interstices regular.
Median ridge continued between crests from base of rostrum *rugosa*, Boi.
Rostrum truncate at base, or at least in middle of base.
Elytra with a distinct black fascia (interrupted at suture) just beyond middle *convexirostris*, n. sp.
Elytra non-fasciate.
Granules of elytra rather large, flat, and decidedly red ... ... *tessellata*, Pasc.
Granules of elytra small, convex, and dark ... *tibialis*, Blackb.

RHINOPLETHES FOVEATUS, Pasc. *Hab.*—W.A.: Swan River, Albany.

ATERPUS TUBERCULATUS, Gyll. *Hab.*—Sydney, etc.

A. RUBUS, Bohem. *Hab.*—Tasmania.

A. CULTRATUS, Fabr. *Hab.*—N.S.W. (widely distributed).

A. GRISEATUS, Pasc. *Hab.*—N.S.W.: Tweed and Richmond Rivers; Q.: Brisbane.

IPHISAXUS ASPER, Pasc. *Hab.*—W.A.: Mount Barker.

* Usually concave at apex and base.

I. ÆTHIOPS, Pasc.	*Hab.*—Mount Barker.
ÆSIOTES LEUCURUS, Pasc.	*Hab.*—N.S.W.: Sydney, Bindogundra.
Æ. NOTABILIS, Pasc.	*Hab.*—Wide Bay.

SUB-FAMILY HYLOBIIDES.

CYCOTIDA LINEATA, Pasc. (M.C. 5099).

Mr. Champion writes me that this species (recorded as from Western Australia by Mr. Pascoe) is really Californian, and = *Otidocephalus vittatus*, Horn.

SUB-FAMILY BELIDES.

BELUS GRANULATUS, Lea.

I find that this is but a variety of *B. centralis.* I have typical specimens of the latter from Sydney and Victoria.

BELUS ABDOMINALIS, Blackb.

This is a synonym of *B. parallelus*, Pasc. The species can be readily identified by its narrow form and by "each of the first four segments having a transverse row of three sharply defined round denuded spots" (Blackburn); or, as Mr. Pascoe says:—"Abdomine segmentis quatuor basalibus maculis tribus denudatis margine posteriore notatis."

SUB-FAMILY BALANINIDES.

BALANINUS.

All the Australian species of this genus differ from the five British species *(turbatus, villosus, betulæ, rubidus, and salicivorus)* that I have under examination, by having the third tarsal joint dilated to a much greater extent, with the claw joint just passing its apex. Of the previously described Australian species *amœnus* (from Sydney*) may be readily recognised by its black colour and by the presence of four prothoracic, five elytral, and a scutellar spot of snowy scales; *Mastersi* (from Port Denison) has a post-median elytral fascia (primarily caused by semi-denuded spaces), and with an unusually long rostrum in the female.

For the opportunity of describing the new species I am indebted to Mr. George Masters:—

Clothing forming patterns.
- Legs black ... ... *amœnus*, Fab.
- Legs more or less red.
  - Elytra with a post-median fascia *Mastersi*, Pasc.
  - Elytra with longitudinal markings as well ... ... *intricatus*, n. sp.

Clothing uniform or almost so.
- Funicle with first joint as long as the second ... ... *aequalis*, n. sp.
- Funicle with the first joint distinctly longer than the second.
  - Shoulders produced ... ... *delicatulus*, n. sp.
  - Shoulders rounded ... ... *submaculatus*, n. sp.

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* I have just received a specimen of this species from Mr. Geo. Compere, who captured it at Brisbane.

BALANINUS INTRICATUS, n. sp.

Male. Dark red, legs (except knees and tarsi), rostrum (but not mandibles), and antennæ (except club) paler. Densely clothed with setose scales, varying from almost white to reddish brown; the pale scales form five lines on prothorax (with single ones scattered rather thickly about), clothe the scutellum, basal third of suture, the third interstice beyond the middle (between these the scales are also pale), and form a feeble oblique fascia just beyond the middle, but not extending to sides or suture; on each elytron three dark patches may be seen: one close to suture, one about middle commencing on third interstice, and one between it and apex, but confined to the third interstice. Legs with pale, the under surface with still paler, scales.

Rostrum with narrow punctate grooves on each side behind the antennæ. Antennæ inserted in exact middle (if the mandibles are excluded) of rostrum; first joint of funicle almost as long as the second and third combined. Punctures of *prothorax* and *elytra* traceable with difficulty; third interstice of the latter apparently feebly raised posteriorly; shoulders rounded. Length, $3\frac{1}{3}$; rostrum, $1\frac{3}{4}$; width, 2 mm.

Female. Differs in having the rostrum considerably longer ($2\frac{1}{2}$ mm.), less curved, and with the punctures in simple series instead of in grooves; antennæ inserted nearer the base; the clothing denser and rather paler (the elytral suture is almost entirely clothed with pale scales and the short post-median fascia is very distinct), but with the dark markings on the elytra more sharply defined.

Hab.—Sydney (Macleay Museum).

The scattered pale prothoracic scales are placed transversely on the male, but obliquely on the female.

BALANINUS ÆQUALIS, n. sp.

Female. Reddish-brown; mandibles darker, rostrum and antennæ paler. Moderately densely and almost uniformly clothed with pale ochreous (or dark stramineous) scales, slightly darker on elytra and paler on legs than elsewhere.

Rostrum moderately densely punctate at sides of basal fifth, elsewhere sparsely punctate. Antennæ inserted just behind the middle of rostrum; two basal joints of funicle equal in length, their combined length equal to that of the remaining joints. *Prothorax* (except front margin) densely punctate. *Elytra* punctate-striate, the punctures deep, the striæ narrow, but sharply defined; interstices transversely wrinkled, shoulders produced. Length, 5; rostrum, $3\frac{1}{6}$; width, 3 mm.

Hab.—Cairns (type in Macleay Museum).

In the specimen described the middle of the prothorax is almost nude, but this appears to be due to abrasion.

Balaninus delicatulus, n. sp.

Female. Of a very pale red, knees, tarsi, and mandibles darker. Rather densely clothed with stout, adpressed white scales, denser on middle of prothorax, suture, and under surface than elsewhere.

Rostrum with small and moderately dense punctures, not much denser, but rather larger towards base than elsewhere. Antennæ inserted three-sevenths from base of rostrum; first joint of funicle stouter than and the length of the two following combined. *Prothorax* with the punctures concealed. *Elytra* distinctly striate, with moderately distinct punctures; shoulders very decidedly produced. Length, $3\frac{4}{5}$; rostrum, 2; width, $1\frac{4}{5}$ mm.

Hab.—N.W. Australia (type in Macleay Museum).

To the naked eye the elytra appear to be feebly mottled, but this is owing to the scales being rather thinner in places, and allowing the derm to be seen.

Balaninus submaculatus, n. sp.

Female (?). Reddish-brown; legs, rostrum (but not mandibles), and antennæ paler. Densely and uniformly clothed with dark stramineous (or pale ochreous) scales (slightly paler on under surface); on each elytron near the apex is a small patch of slightly paler scales, immediately behind which is a small, dark, semi-denuded space, so that the patches (which are of the same shade as the scutellar scales) are rendered rather distinct.

Rostrum equally curved throughout; sparsely and finely punctate. Antennæ inserted nearer base than apex; first joint of funicle almost as long as the two following combined. *Prothorax* with the punctures concealed. *Elytra* with the punctured striæ almost concealed, but the punctures marked by larger scales; shoulders rounded. Length, $4\frac{1}{2}$; rostrum, 3 (vix.); width, $2\frac{1}{2}$ mm.

Hab.—N.S.W.: Kiama (type in Macleay Museum).

In this species the eyes are coarsely faceted (almost twice as coarsely as in the British *turbidus)*, whilst in the three preceding they are finely faceted.

SUB-FAMILY LAEMOSACCIDES.

Laemosaccus.

I did not notice till quite recently that there was an omission of a line in the tabulation of the genus, given in P.L.S., N.S.W., 1896, p. 312. Line 15:—"Elytra more or less red," would appear to govern *querulus*, *longimanus*, *subsignatus*, *funereus*, and *dubius*, instead of *querulus* only; line 16 should have been:—"Elytra entirely black."

Notes on South Australian Marine Mollusca, with Descriptions of New Species, Part I.

By Jos. C. Verco, M.D. (Lond.), F.R.C.S. (Eng.), etc.

[Read August 2, 1904.]

Plate XXVI.

Dentalium intercalatum, *Gould.*

Proc. Bost. Soc. Nat. Hist. vii., p. 166 (1859); Otia, p. 119; Sowerby in Conch. Icon., xviii., pl. vii., fig. 45 (1872). Type locality, China Seas (North Pacific Expl. Exped.). Pilsbry in Tryon's Manual of Conchology, vol. xvii., p. 25, pl. xi., figs. 88, 89. *D. Bednalli*, Pilsbry & Sharp, Man. of Conch., vol. xvii., p. 248, pl. xxxix., figs. 1, 2, 3; type locality, St. Vincent Gulf (W. T. Bednall). *D. octogonum*, Angas (non Lam.), P.Z.S., 1878, p. 868, Henley Beach, S.A.

Angas misidentified our shell from Henley Beach as *D. octogonum*, Lam., and cited it as a South Australian shell in P.Z.S., 1878, p. 868. Pilsbry & Sharp, in Tryon's Man. of Conch., vol. xvii., p. 248, described a shell under the name of *D. Bednalli*, from St. Vincent Gulf, sent to them by Mr. W. T. Bednall. This name would stand, were it not that specimens of our extremely variable species are inseparable from *D. intercalatum*, Gould, 1859, which has priority.

I have examined more than three hundred individuals, dredged by me in St. Vincent and Spencer Gulfs, Investigator Strait, and Backstairs Passage. They have been taken alive at all depths between eight and twenty-two fathoms, chiefly in muddy bottoms. I have vainly endeavoured to discover more than one species among them. They are exceedingly variable, and were it not for intermediate forms, quite a dozen species might be created.

Its length varies, of course: firstly, with its age; individuals when very young are only 5 millimetres, when senile 37; secondly, with the amount of its posterior end which has been removed, so that a stouter, older shell may not be so long as another which is evidently younger and has not suffered so much truncation.

Its curvature is also very variable. In its early stage of growth it is well curved, but becomes gradually, though markedly, less so as it gets older. Since the posterior end is progressively removed, the mature shell has an appearance quite different from that of the immature, being nearly straight and bluntly truncated, instead of well curved and posteriorly acuminate. The same individual in its two extreme stages of growth, without the controlling intermediate

examples, might be excusably described as distinct species. This probably partly explains why the name of *D. Bednalli*, Pilsbry & Sharp, has been added to that of *D. intercalatum*, Gould, the former being an old individual, and the latter a young one.

One shell, compared in the Natural History Museum, London, with that labelled *D. intercalatum*, Gould, was identical, and represents our immature, curved, sharp-pointed stage. The figure given in Tryon's Man. of Conch. corresponds with it, as does also the description there transcribed, even to the origin of its secondary riblets, first in the two interspaces on the outer curve, and somewhat later in the lateral ones and on the concave side, as italicised in the manual. Hence, though the type locality of this species is given as China Seas, the identity of our South Australian form is indisputable.

The number of ribs very rarely remains the same throughout the entire length of the shell; thus one with eleven rather acute ribs at the posterior end has but eleven at the anterior. Almost always the ribs become more numerous with age. The increase is effected in two ways, by intercalation and by rib splitting.

1. By intercalation. Generally in the centre of an interspace a riblet arises, and gradually enlarges until it equals the original ribs. The stage of growth at which this begins is variable, not only in different shells, but in the several interspaces of the same shell. For instance, when the individual is quite immature every interspace may bear a riblet, whereas when senile there may be only the first indication of one. Again, one interspace may show a riblet very soon, and later, other interspaces may develop them at varying distances as in the typical *D. intercalatum*. Besides these secondary riblets, eventually tertiary riblets may arise in their interspaces and further multiply the costations. Still another variation is to be soon—instead of a single secondary costula arising in an interspace, two riblets of equal dimensions may develop simultaneously. This twin intercalation alone may be found in an example, or there may be every combination of single and double intercalation.

2. By rib-splitting. A groove begins to form in a rib, and gradually grows in depth and width until it divides it into two. This groove may begin on the centre or on any part of the side of the rib. The ribs so formed may subsequently be cut up by other grooves. Sometimes two or three of such furrows may appear on the same rib at the same time and enlarging at an equal rate form three or four subequal riblets.

The two methods, intercalation and rib-splitting, may occur alone in respective individuals, or both in the same example, and there may be any conceivable ratio between the two methods in different specimens.

The contour of the ribs may vary greatly. They may be at their inception narrow and comparatively high, and may so continue throughout their length. Or after some increase in size they may begin to decline in height until they almost fade out and leave the anterior part of the shell nearly smooth. Their shape may completely change; whereas, at first, they may have concave interstices so as to resemble a fluted column, the ribs may widen out and become convex, while their interstices become reduced to narrow, shallow grooves between broad, approximate, rounded ribs.

The number of ribs at the posterior end is very variable. If multiplication of costæ occurs, it is plain that the older the shell and the more truncated, the greater will be the number of ribs at the posterior extremity; and if such multiplication always began at the same stage of growth and was equally rapid, the number would always be greater with a greater truncation. But such is not the case, hence the number of ribs at the hinder end varies widely. Six is the fewest I have found. But there may be any number beyond this up to fourteen, which is the most yet observed. These larger numbers are by no means restricted to examples with much truncation, nor is there any definite proportion between the number of ribs and the diameter of the shell; some of large diameter at the truncation have but few, and *vice versa*. A diagnosis framed upon the number of ribs would be baseless. Pilsbry suggests the typical form is hexagonal; probably he is right, but usually there are more than six costæ.

The anal appendical tube is wanting in most cases, even during life. When present it may be two or three millimetres long. It may exist when the shell is young and narrow, and be wanting when old and wide; possibly it may have been broken off. It is central and most frequently in the axis of the shell. But it may be distinctly out of the axis, joined at an angle so as to point markedly towards the concave side, or slightly towards the convex, and in one it is funnel-shaped instead of cylindrical. These circumstances confirm the suggestion of its being an outgrowth subsequent to truncation, and not merely a residual inner layer of the shell after the outer portion has been absorbed.

The radula (pl. xxvi., figs. 14*a*, *b*, *c*, *d*) is comparatively large, and contains fifteen rows of teeth, with the formula 1.1.1.1.1. The rachidian tooth is about twice as wide as high, is thickened along its free edge, and thinned along

its attached border. The single lateral is stout and rather short, and has one obliquely placed cusp without serrations. The marginals are trapezoidal flat plates, thickened along their inner end, and the whole or larger part of their upper margin. Mr. Kesteven, in executing the drawings, detected a small accessory plate of chitin (fig. 14*d*). It is somewhat pyriform, stouter at its narrow, attached end, and thinner and slightly striate at its free, expanded extremity. Its height is about one-half that of the rachidian tooth, outside of which it stands, with its base about half-way between this and the lateral. As the laterals overlap the outer fourth or third of the rachidian, this plate lies behind or between the laterals, and being comparatively thin it cannot be seen through the much denser laterals; but in a dismembered radula it can be certainly recognised.

Cadulus acuminatus, *Tate.*

This shell is first referred to as a South Australian species by G. F. Angas, in a paper entitled "A List of Additional Species of Marine Mollusca . . . of South Australia," in Proc. Zool. Soc. of November 5, 1878, p. 868, species 44, *Cadulus acuminatus* (?) Desh., M.S. in coll., Cuming; Holdfast and Aldinga Bays (Tate); also Port Jackson. In the Trans. and Proc. Roy. Soc. of South Australia, vol. ix., p. 194, 1887, Tate, in a paper of October 5, 1886, on "The Scaphopods of the Older Tertiary of Australia," includes *Cadulus acuminatus*, of which he gives a short description, cites it from the "oyster beds of the Upper Aldinga series," and says, "the species is not uncommon in shell sand on the shores of St. Vincent Gulf." In the Manual of Conchology, vol. xvii., p. 183, Pilsbry gives *C. acuminatus*, Tate, pl. xxxii., figs. 47, 48, 49, with a full description.

I have dredged it in St. Vincent and Spencer Gulfs and Investigator Straits and Backstairs Passage at five fathoms, (14 dead), at nine fathoms (29 dead and 3 alive), at seventeen fathoms (80 dead and 12 alive and 7 initial tubes), besides 35 dead and 5 alive at unrecorded depths. These living examples enable me to make some additions to and alterations in Pilsbry's description of what were doubtless beach-rolled specimens. Though glossy and smooth to the naked eye, under the microscope very fine, crowded transverse scratchings are visible. Though usually quite clear and glassy, but for the white opaque internal callous ring near the posterior end, many individuals have fine, milky, transverse lines, and some have opaque, white, subdistant, interrupted bands, or on one side a group of round or oval white blotches.

The posterior end has not a continuous, smooth margin, but is irregular, and has a minute, triangular spine, which projects from it at a very slight angle on the convex border of the shell (pl. xxvi., figs. 5 and 6). This end shows signs of fracture, and suggests that it is not the actual commencement of the shell, but has been broken off from an earlier segment.

Dredged with these are what at first sight appear to be another form of *Cadulus*, or a minute *Dentalium*, measuring up to four or five millimetres in length. These are curved like a juvenile *Dentalium*, and gradually increase in diameter and become less curved. They are evidently fractured at their attenuate posterior extremity, and show a minute, triangular projection from its margin on the convex side. After a very slight inflation near their anterior extremity they are constricted, and then begin to expand again into a funnel-shaped portion, which may measure one, two, or three millimetres in length. This end is irregular in outline and evidently fractured. The funnel is clear and glassy, whereas the dentalium-shaped tube is like ground glass from very fine, crowded, transverse, milky lines. Some individuals lack the funnel, and end at the constriction.

In one instance the posterior end of a *Cadulus acuminatus* has slipped into the funnel-shaped extremity of one of these shells, and allows a comparison to be made between them.

In my opinion this dentalium-like shell is the juvenile stage of the *Cadulus acuminatus*. When it has grown to a certain length and diameter there is a trifling inflation, then it becomes definitely constricted, somewhat obliquely, and then begins to expand to form the mature shell. After a time the earlier portion becomes detached at the constriction, and in the fracture a tiny, projecting spine is left on the adult portion at the convex side, which spine is a spicule of the juvenile shell just where it is becoming contracted.

If this deduction prove correct, and I have no doubt about it, probably all the species belonging to the group *Cadulus dentalinus* represent only immature stages of species in the *C. acuminatus* group. This will necessitate a careful re-examination of all these forms, and a considerable revision of their nomenclature.

The radula, which was difficult to get because the animals were dried up, shows a formula of 1.1.1.1.1. Thirteen rows can be counted; possibly there may be a few more in a complete ribbon. The rachidians are higher than wide, narrower at their attached end, where they are widely notched, with a wide, simple, flange-like cusp (pl. xxvi., figs. 1*a*, 1*b*, 1*c*); the laterals are rhomboidal, much larger and stouter, espe-

cially at their upper inner part, and are notched at their lower inner angle to form two small cusps. The marginals are not quite so large, are rhomboidal plates, and quite simple in outline. The laterals are very different from the rather remarkably shaped denticles of *C. propinqua*, figured in Man. of Conchology, vol. xvii., pl. xxxix., fig. 11.

Leiopyrga octona, *Tate*.

Trans. Roy. Soc., S. Aust., vol. xiv., 1891, part ii., p. 260, pl. xi., fig. 5.

Dredging has supplied some living examples of this species, from which the operculum and radula have been obtained. The operculum (pl. xxvi., fig. 15) is horny and multispiral, five or six revolutions, with central nucleus. To the margin of the spirals is attached a thin membrane, rather less than half as wide as the spiral. It is radially striated with slightly wavy lines. From the earlier whorls it is absent, doubtless worn away, and is fragmentary and ragged on the next to the last whorl. The radula (pl. xxvi., figs. 16, 17, 18) has for its formula ∞ (5·1·5) ∞. As the examples had been allowed to dry instead of being preserved in spirit, the radula was difficult to isolate, and not in perfect condition. There is a rachidian tooth nearly circular or quadrate, with a slight central projection of the free edge. Then follow five laterals on each side, with a thickened outer border, and with the free upper margin bent over throughout its whole extent. These eleven central denticles have no serrations. Then follow short, stout uncini, which gradually become longer and narrower, and finally are subulate. The number of these marginals is indefinite. They have about half a dozen minute serrations near their free end. These are not shown in fig. 18, though seen in fig. 17.

The operculum and radula of this species determine its location in the *Trochidæ*, and not in the *Turbinidæ*, and close to *Bankivia*. Fischer, Manuel de Conch., 1887, p. 810, places "*Liopyrga*" as a genus provisionally in the vicinity of *Phasianella* with the remark, "the operculum is unknown." Pilsbry, in Manual of Conchology, vol. xi., p. 10, 1889, makes it a section of *Bankivia*, and at p. 139 refers to "the thin, membranaceous *Trochus*-like operculum" and "the teeth like those of *Margarita*," in Watson's description of the animal of *L. picturata*, H. & A. Adams. Our species has the same characters and should have the same place. It is quite possible it should have the same name. Tate diagnoses *L. octona* from *L. picturata* by three features: its conspicuous cinguli, its convex whorls, and its linear suture. But its cinguli vary in validity; in some examples they are valid in

all the spire whorls, in others the upper whorls show them plainly, but the lower whorls very indistinctly, though in the latter they are very valid over the base of the body whorl. In some *L. picturata*, from Port Jackson, sent to me by Dr. Cox, there are quite distinct indications of spiral cinguli on the spire whorls, though in most they are wanting. Our shells vary much in the convexity of their whorls. Some with well-marked cinguli are typically convex, others equally cingulated are almost straight-sided, whereas samples of *L. picturata*, from Port Jackson, may be convex. I am disposed to think Tate's species is no more than a validly spirally striate variety of *L. picturata*, Adams.

The colouration of our shell is just as variable as that of *Bankivia fasciata*, Menke. It may be wholly white, or purple, or may be banded or spotted or flamed or blotched, or zig-zagged with pink, brown, or yellow, in very pretty and abundant variety.

Hab.—Dredged in Investigator Strait, St. Vincent Gulf, Backstairs Passage, and off Newland Head; 15 fathoms, 3 dead; 17 fathoms, 8 alive, 9 dead; 20 fathoms, 10 dead; 22 fathoms, 2 recent, 42 dead.

Cassidea sinuosa, *sp. nov.* Pl xxvi., figs. 7, 8, 9, 10*a*, *b*, *c*.

Shell roundly oval, thin. Nucleus of two and a half whorls, smooth, flatly rounded. Spire whorls, three, rounded, with spiral liræ, 13 in the penultimate; the posterior three are linear and adjacent, the next three flatly rounded; interspaces, at first equal in width to liræ, but becoming gradually narrower, till reduced to shallow, wide incisions. Oblique accremental growth lines, crossing liræ and interspaces. Suture linear, finely crenulate. Body whorl large. Suture linear, faintly channelled towards the aperture, where it slightly ascends. Sculptured with flat, broad, slightly raised liræ, least marked over the centre of the whorl, becoming gradually more valid towards the suture, and most valid anteriorly above the notch. Numerous subdistant, axial, accremental striæ, crenulating the suture, more valid and crowded towards the aperture. Aperture obliquely oval, widened anteriorly, compressed for about three millimetres posteriorly. Outer lip sinuous, projecting for about four millimetres below the suture, then receding in a shallow curve to the notch; slightly bevelled within, and faintly toothed. Some callus thickening inside the posterior projection, which is slightly incurved. Columella moderately arcuate, numerous oblique wrinkles on the lower half. Inner lip spread thickly over the varix of the notch, forming a small rhima above and below it, thinly but widely spread over the body

whorl to meet the outer lip. Notch well marked. Ornament, five spiral rows of quadrate rufous spots, one immediately below the suture, and one just above the notch, from eight to ten spots in each row. Length, 24 millimetres; breadth, 15; aperture, 16 by 7.

Hab.—Dredged in Investigator Strait, Backstairs Passage, and off Point Marsden, Kangaroo Island; in 15, 16, 17, 19, and 20 fathoms; 22 individuals, young and mature, alive and dead.

Diagnosis.—From *Cassis pila*, Reeve. It is more ovate, much less globular, and has no varix on the outer lip, which is sharp and peculiarly sinuous. From *C. Adcocki*, Sowerby. It is more elongate, has no longitudinal plicæ, the whorls are not angulated nor concave below the suture, there is no thick, granulated, infra-sutural band, there are no nodules on the last whorl, the labrum is not thickened, but is sinuous. It is not represented in the British Museum.

Its radula shows a single rachidian tooth, with a long, central cusp, and six gradually decreasing cusps on each side; a long lateral tooth, with about thirteen cusps, sloping obliquely inwards, and two uncini, not quite equal in size.

Variety A.—Is slightly narrower, being 19 mm. by 11, instead of 12. In place of five rows of rufous spots there are oblique, wavy, or curved brown radial bands, starting from a row of spots below the suture.

Obs.—The largest specimen is 27·5 mm. in length. When mature or senile there is a marginal linear thickening outside the labrum, which becomes well bevelled inside. In living specimens the ground tint is light pinkish brown, deeper on the nucleus and the earlier whorls. The number of spots in a spiral row varies considerably, even in the same shell, from 7 to 15.

Cancellaria pergradata. *sp nov.* Pl. xxvi., fig. 19.

Shell small, solid, brown, fusiform. Nucleus prominent, one turn and a half, apex imbedded, smooth, light horn colour. Spire whorls, three and a half, sharply angled. Behind the angle tabulate, with one tuberculate spiral lira. At the angle a stout spiral cord, coronate with about 25 sharp tubercles. Penultimate, with four very valid spiral ribs, not quite equal in width to the interspaces (which are as deep as wide), validly tuberculate, by narrow axial striæ, running from suture to suture, very obliquely from posterior suture to angle.

Body whorl, obliquely roundly pyramidal, with ten spiral cords rounded, about half as wide as the interspaces, crossed by 26 axial lamellæ, which form rounded tubercles at the junction, and coronate the stouter cord at the angle. Finer microscopic axial striæ cross the interspaces between the lamellæ.

Aperture obliquely oblong, narrowed and deviated to the left anteriorly, where it ends in a moderate-sized notch. Posteriorly square, external lip simple, thin, corrugated by the spiral ribs, uniformly slightly curved. Columella nearly straight, with two oblique anterior plates, inner lip as a thin glaze, not obliterating the spiral ribs on the base of the whorl.

Colour, uniform dark chestnut-brown.

Length, 10 millimetres; breadth, 5. Aperture length, 4·5 mm.; width, 3.

Hab.—St. Vincent Gulf, 17 fathoms, 2 broken, 1 recent; Backstairs Passage, 17 fathoms, 1 alive, 3 dead; 22 fathoms, 2 dead.

Stephopoma nucleogranosum, *sp. nov.* Pl. xxvi., figs. 11, 12, 13.

Shell attached, solitary, or conglomerate. Nucleus horn-coloured or white; nautiloid, of one turn and a half; diaphanous, slightly effuse at its aperture; covered with minute granules, arranged in crowded lines corresponding with the accremental lines. The shell springs from within the slightly trumpet-shaped mouth, which projects all round and marks off the embryonic shell from the next whorl. Two and a half of these follow in the same plane, rather rapidly enlarging, and attached to the surface on which the shell rests; then come one or two whorls, coiled above and adhering to those below; and, finally, a free, more or less twisted tube, varying up to an inch in length. The attached whorls along their outer under surface throw out numerous scales of attachment at irregular intervals. The adherent whorls have a pronounced rounded carina along their upper outer part, which gradually becomes less valid along the free tube, until it may be indistinguishable. From this carina the side is flat to the carina of the whorl below, so that a young shell has the shape of a short cylinder fixed by one end on the rock, etc. There are moderately developed accremental striæ, which become ruder and rounder on the free tube.

Aperture circular, or very slightly elliptical.

Colour translucent white. Some are tinged more or less with pinkish-chestnut.

Operculum horny, multispiral: nucleus central, setigerous. Setæ comparatively narrow beyond the base of attachment,

then flatly expanded with numerous (perhaps eight) fine setæ on either side, beyond these the seta bifurcates; one part continues nearly in the same axis, and is the larger and longer; the other stands out at an acute angle and generally divides into two. Resting on the operculum, in the throat of the shell, may be three or four embryos, like minute nautilus.

Cylindrical portion about 6 millimetres in diameter and 4 or 5 high; aperture 3 or 4 in diameter.

Hab.—Backstairs Passage, from 16 to 23 fathoms, many alive.

I compared this species with a solitary small specimen in the British Museum, of unknown habitat, said to be a type of *Vermetus senticosus*, Mörch, and regarded it as identical. But a comparison of the nucleus of our shell with the description and figure of the type of Mörch's shell, given in P.Z.S., 1861, p. 150, pl. xxv., figs. 2 and 14, disproves this. The few large tubercles of his figure are quite different from the numerous minute granules of ours, and the 25 valid mammillæ at the periphery are wanting in ours. Then the form of the opercular setæ is quite dissimilar. Ours has not the expanded, sub-basal lamina he depicts, nor has his the bifurcation which ours always shows. His description indicates his possession of several shells, and not one only. Possibly the British Museum specimen may not have been the actual individual taken as the type, though resembling it externally, but may be the species now described.

Nacella crebrestriata, *sp. nov.* Pl. xxvi, figs. 20, 21.

Shell oblong-ovate, laterally compressed, depressed conic. Apex subcentral, somewhat anterior; rounded, simple. About sixty radial riblets, rounded, about as wide as the interspaces; fine microscopic accremental striæ. Translucent, with an opaque, white apex, and a white flame in the centre of the upper half of the steep anterior slope: on the posterior slope, in its upper half, is a series of about seven opaque, white, concentric markings, consecutively increasing in transverse extent. The muscle scar is open towards the shorter end of the shell. Length, 3·8 millimetres; breadth, 2·1; height, 1·8; apex, 1·1 and 2·7 from the margin.

Hab.—"South Australia," from Professor Tate's collection; no more exact locality given. He had labelled it *Scutellina*; but that genus has the apex directed away from the opening of the muscle scar. Its size and shape recall our *Nacella parva*, Angas, from which it differs in being more solid and in its radial striation.

EXPLANATION OF PLATE XXVI.

Fig. 1*a*. *Cadulus acuminatus*, Tate, rachidian, from the back.
Fig. 1*b*. *Cadulus acuminatus*, Tate, rachidian, from the front.
Fig. 1*c*. *Cadulus acuminatus*, Tate, rachidians, side view; diagrammatic.
Fig. 2. *Cadulus acuminatus*, Tate, lateral.
Fig. 3. *Cadulus acuminatus*, Tate, marginal.
Fig. 4. *Cadulus acuminatus*, Tate, young.
Fig. 5. *Cadulus acuminatus*, Tate, adult.
Fig. 6. *Cadulus acuminatus*, Tate, adult, turned round.
Fig. 7. *Cassidea sinuosa*, Verco, profile.
Fig. 8. *Cassidea sinuosa*, Verco, ventral view.
Fig. 9. *Cassidea sinuosa*, Verco, protoconch.
Fig. 10*a*. *Cassidea sinuosa*, Verco, marginals.
Fig. 10*b*. *Cassidea sinuosa*, Verco, lateral.
Fig. 10*c*. *Cassidea sinuosa*, Verco, rachidian.
Fig. 11. *Stephopoma nucleogranosum*, Verco, adult.
Fig. 12. *Stephopoma nucleogranosum*, Verco, young.
Fig. 13. *Stephopoma nucleogranosum*, setæ from operculum.
Fig. 14*a*. *Dentalium intercalatum*, Gould, var. *Bednalli*, Pilsbry, lateral.
Fig. 14*b*. *Dentalium intercalatum*, Gould, var. *Bednalli*, Pilsbry, rachidian.
Fig. 14*c*. *Dentalium intercalatum*, Gould, var. *Bednalli*, Pilsbry, marginal.
Fig. 14*d*. *Dentalium intercalatum*, Gould, var. *Bednalli*, Pilsbry, accessory plate.
Fig. 15. *Liopyrga octona*, Tate, operculum. *a.a.* Marginal fringe. *b.b.* Spirals.
Fig. 16. *Liopyrga octona*, Tate, rachidian and laterals, one side.
Fig. 17. *Liopyrga octona*, Tate, last marginal.
Fig. 18. *Liopyrga octona*, Tate, first marginal.
Fig. 19. *Cancellaria pergradata*, Verco.
Fig. 20. *Nacella crebrestriata*, Verco, side view.
Fig. 21. *Nacella crebrestriata*, Verco, dorsal view.

J

Notes on South Australian Decapod Crustacea. Part I.

By W. H. Baker.

[Read July 5, 1904.]

Plates XXVII. to XXXI.

In presenting a first paper of a series of studies of South Australian *Decapoda*—a department of our natural history that has heretofore been much neglected—I wish to acknowledge the kind assistance of the President of the Royal Society of South Australia, who has allowed me the use of the specimens from his dredging excursions; Professor Stirling, F.R.S., and Mr. Zietz, F.L.S., of the Adelaide Museum; also of Mr. S. W. Fulton, of Melbourne, who is studying the same branch, and whose help I much appreciate; and also of Mr. G. M. Thomson, F.L.S., of Dunedin, who has been good enough to look through the pages and make some necessary corrections.

In the Proceedings of the Zoological Society, London, for 1863, appear descriptions and figures of a group of shrimps from South Australian waters, by the late Mr. Spence Bate; these were dredged, he says, in about four fathoms, in St. Vincent Gulf by Mr. Angas, and were forwarded by him to the British Museum. The first mentioned is a remarkably beautifully coloured species, *Angasia pavonina*, which Mr. Angas himself has figured and coloured, and Mr. Bate states that the genus *Angasia* was instituted by Mr. White, of the British Museum, to receive it.

Since this record I am able to find mention of the following species which have been referred to the same genus, viz.:—

A. lanceolata, Stimpson, from Hongkong.

A. carolinensis, Kingsley, from the east coast of the United States.

A. Stimpsoni, Henderson, from the Gulf of Martaban.

To these I wish now to add four species from our coast which are more differentiated by their external contour than by the details of their structure.

The Rev. T. R. Stebbing, in his "History of Recent Crustacea," remarks at page 233 that "little agreement exists as to the precise classification of some of the genera of the family *Hippolytidæ*"—to which *Angasia* belongs; and Mr. Bate, in his "Macrura of the Challenger," sets out the genera with which he is there engaged as chiefly differentiated by the condition of the mandibles and the number of joints into which the carpus of the second pair of legs is divided.

According to this classification the genus *Angasia* would come in between the genera *Latreutes* and *Hippolyte*, for in it the mandible is without appendage, and the carpus of the second pereiopod is three-jointed, a like condition to what obtains in *Latreutes*, and the question would arise: Why not unite the two genera? The reply must be that they differ sufficiently in other respects to warrant the separation.

There is no doubt that the family greatly requires revision, and if the addition of a few more species renders this more imperative, good will be accomplished.

Sub-order, MACRURA.

Tribe, CARIDEA.

Family, HIPPOLYTIDÆ. (Legion, POLYCARPINEA.)

Genus **Angasia**, *White.*

Body usually elongate.

Carapace without a spine on the gastric region, and without supra-orbital spines.

The rostrum usually is very long, laterally ridged, pointed rigid, tapering, and strongly keeled below, with spines only on the under side.

The antennules are much shorter than the rostrum, and usually shorter than the antennal scales.

The antennal scales also are shorter than the rostrum, long, narrow, robust, regularly tapering to a terminal spine.

The mandibles consist only of the molar process.

The third maxillipeds are short, spatuliform, with the terminal joint short, and strongly spined on its anterior border without exopod.

The second pereiopods have a triarticulate carpus.

The branchiæ are five.

This genus differs from *Latreutes*, in the more elongate form, the shape of the rostrum, in the shape and proportionate length of the joints of the third maxillipeds, and in the proportionate lengths of the carpal joints of the second pereiopods, and in the pleura of the pleon and other minor characters.

Angasia elongata, *n. sp.* Pl. xxvii., figs. 1-4.

Body very elongate, narrow in the vertical direction, especially anteriorly, and laterally compressed.

Carapace more than one-third the length of the body, exclusive of rostrum and telson, about as long as the first four segments of the pleon, smooth, not markedly depressed anteriorly, its anterior margins have rather long subocular spines with slight lobes just above them, the external angles

also are strongly spined and lie posterior to the subocular at the lower level.

The pleon is very slightly geniculate at the third segment. The first five segments do not differ much in dorsal length except the first, which is shortest, and their sides are not very deeply produced, that of the fifth is produced posteriorly well along the sixth—in some specimens nearly its whole length—and there is a small spine on its posterior descending border. The sixth segment is much longer than the dorsal portion of the fifth, its posterior margin bears a lobed spine projecting over the base of the telson on each side, and the posterior angles also are very acute.

The telson is slightly longer than the sixth segment, narrow, arched, and tapering with the usual four quadrately placed spines, which are placed rather low down; it terminates with six strong spines, two of which are small and median, one above the other, the next two outer and longer, the external two short.

The rostrum is rather more than one and a half times as long as the carapace, straight or slightly curved upwards, gradually tapering, with its base occupying the whole of the interocular space, having a dorsal and two lateral ridges; deeply carinate below, especially at the proximal end, with numerous spiniform teeth which decrease in frequency forwards, but do not reach near to the apex. Between the teeth there are soft hairs. (Three specimens had respectively sixteen, eighteen, and over thirty teeth.)

The ophthalmopods are rather short, they are pyriform, and capable of being partially covered by the lateral ridges of the rostrum.

The antennules are short and partially obscured by the lateral ridges of the rostrum. The peduncle does not reach half the length of the antennal scale, the first joint is excavate above to receive the ophthalmopod, the stylocerite spine reaches a little beyond its end, the second joint is longer than the third, and together they are about as long as the first joint. The upper flagellum is thickish and shorter than the peduncle, the lower one slender and longer, but does not reach to the end of the antennal scale. The antennal scales are very long, narrow, rigid, and taper to acute terminal teeth. The second peduncular joint of the antenna has a strong external spine at the base of the scale, and the remaining joints are only about one-fifth the length of the scale. The flagellum is slender and long.

The third maxillipeds are short, only reaching a little beyond the anterior angles of the carapace. The first of the three joints of the endopod is long and a little curved, or twisted proximally, the second very short, the third is

short but longer than the second, moderately broad, strongly setose, wedge-shaped in a side view, its distal margin furnished with seven strong teeth, the apical one stronger than the rest. The first pair of pereiopods are short, moderately robust, not reaching as far as the third maxillipeds. The merus is a little longer than the carpus and is scarcely excavate at its distal end, the carpus is cup-shaped, and distally hollowed to receive the rounded proximal end of the propodus; it bears above a small process tipped with hairs and a little row of setæ near its distal end on the inner side, the palm is a little longer than the carpus, and is articulate to it at its lower edge, it tapers somewhat and is slightly curved, its proximal end is rather swollen above. The fingers are setose, excavate, rather weak, much shorter than the palm, with terminal curved teeth. The second pair of pereiopods are very slender, weakly chelate, reaching as far as the first pair. The ischium and merus are subequal in length, the carpus longer, it widens a little distally, and its third division is subequal to the first, the middle one being short; the propodus narrows distally and is slightly curved. It is a little longer than the third division of the carpus, the fingers are very weak and setose at their tips.

The third and fourth pairs of pereiopods are rather long, moderately robust, reaching further forward than the maxillipeds, the meri are long, and are provided each with a distal spine below. The carpi are a little produced distally above, the propodi are more than twice as long as the carpi, they are a little compressed, and narrow somewhat distally and are moderately spinose behind, the dactyli are slightly curved, strong, and terminally bifid, with a few strong spines towards the proximal ends. The fifth pair are shorter, but otherwise similar. The pleopods are long and well developed in both sexes.

The uropods are a little longer than the telson, they are narrow, the rami are nearly equal in size and well developed, the outer ramus has a sinuate division and two subterminal spines on the outer side.

Length of carapace, 15 mm.

Length of pleon, 25 mm.

Length of rostrum, 22 mm.

Length of antennal scale, 8 mm.

Dredged by Dr. Verco, about fifteen fathoms, S.A. coast; also specimens from Port Victor from Mr. Pullein.

Types in the Adelaide Museum.

Angasia kimberi, *n. sp.* Pl. xxvii., fig. 5.

Body arched, much compressed laterally, elongate, moderately slender, tapering anteriorly and posteriorly from the

third segment of the pleon. Carapace nearly one-third the length of the body, excluding rostrum and telson, dorsally depressed from near the posterior end forward, anterior margin as in the preceding species.

The pleon is shaped differently from that of the preceding species, the pleura are deeper, and it is more geniculate at the third segment, the fifth segment is well produced posteriorly to about half the length of the sixth, and bears a spine on the oblique posterior margin; the sixth segment is also similarly spined as in *A. elongata*, and is about twice as long as the dorsal portion of the fifth. The fifth segment is a little longer than the first, the third and fourth and second and fifth subequal in length.

The telson is unfortunately broken.

The rostrum is very long (also broken in specimen), much longer than the antennal scales in the same oblique line with the anterior part of the carapace, it is dorsally and laterally ridged, the teeth on the lower carina are numerous and rather crowded.

The ophthalmopods are as in *A. elongata*, as also are the rest of the appendages in most of their parts.

The second pereiopods have the carpus equal in length to the merus, of its three joints the third is longer than the first.

Length, excluding rostrum and telson, 37 mm.

This species differs from the preceding in the more laterally compressed and rather less slender and tapering body, the arched shape, and somewhat deeper pleon segments, and in the depressed carapace; it is also like *A. pavonina*, but differs specifically in the elongate, many toothed rostrum, and the shape of the first and second pereiopods.

Dredged by Mr. W. J. Kimber in about four fathoms, off Port Willunga.

Type, one female, in Adelaide Museum.

Angasia robusta, *n. sp.* Pl. xxviii., figs. 1-8.

Body robust, smooth, moderately elongate.

Carapace not depressed as in *A. kimberi*, spined anteriorly as in the same, also bearing about the same relation in length.

The rostrum is only a little longer than the carapace, it is very strong, slightly curved upwards, and tapers to a point, it has dorsal and lateral ridges, which are very pronounced, and a deep carina below, provided with five to seven small, remote teeth.

The ophthalmopods are not so pyriform as in the preceding species.

The stylocerite spine of the antennular peduncle is strong and extended beyond the first joint, the second and third joints are subequal in length, the upper flagellum is short, about equal in length to the second and third joints of the peduncle together, the whole scarcely half the length of the antennal scale; the lower flagellum is very slender, and a little longer than the upper.

The antennal scale is long, reaching about three-fourths the length of the rostrum, rigid, narrow, tapering, the external spine on the second joint of the peduncle is not very acute, the remainder of the peduncle is only about one-sixth the length of the scale, the flagellum is nearly as long as the body of the animal.

The third maxillipeds are very robust, reaching a little further than the anterior angle of the carapace, the terminal joint is very broad at the end, and is provided with 11-13 strong, but short, teeth, six or seven of which are on the inner margin.

The first pair of pereiopods are scarcely different from those of the preceding species, except that the propodus is not so swollen above at the proximal end, and the joints are comparatively a little longer.

The second pereiopods are long, slender, and reach forward a little beyond the maxillipeds. The merus is a little shorter than the carpus, the first and third carpal divisions are subequal. The ischium of this joint is marked with two small spines, which are close together and on the inner side.

In the third, fourth, and fifth pairs the carpal joints and the dactyli are longer than in the preceding species.

The pleon is moderately geniculate at the third segment. The first segment is the shortest, the third more than twice as long as the first, the second and fifth are subequal in length, and the fourth a little longer, the sixth is not much longer than the fifth, the pleura of the segments are very deeply produced, almost covering the peduncles of the pleopods in the females; their posterior angles are scarcely rounded or abrupt, the posterior oblique margin of the fifth is without spine, and is produced much deeper than the sixth segment, the postero-lateral margin of the sixth segment has a large lobe, tipped with a small spine projecting over the base of the telson.

The telson is longer than the sixth segment of the pleon, it narrows quickly, tapering to end in four spines, the two inner ones longer. The uropods are longer than the telson, the outer ramus is well thickened on the external margin.

Length, excluding rostrum and telson, 38 mm.

Length of carapace, 13 mm.

Length of rostrum, 16 mm.

Length of antennal scale, 12 mm.

The general appearance of this species is well differentiated from the two preceding; from *A. pavonina* it differs first in its greater robustness, secondly in the shape of the rostrum and its number of teeth, thirdly in the comparative length of the joints of the first pair of pereiopods, fourthly in the shape of the second pereiopods, which do not expand distally to such a degree, and fifthly in the circumstance that the telson ends in four spines.

Dredged in from 10-12 fathoms, St. Vincent Gulf.

Types in the Adelaide Museum.

Angasia tomentosa, *n. sp.* Pl. xxix., figs. 1-4.

Body less elongate than in each of the preceding species, rather robust, covered on all parts with a harsh tomentum.

Carapace nearly as long as the first four segments of the pleon, a little elevated dorsally, anteriorly descending obliquely to the rostrum, deepening behind, the anterior margin has two small, subocular spines close together, the lower one more acute, the antero-lateral angle has a larger spine which projects further forward than the suboculars.

The pleon is very slightly geniculated at the third segment. The first five segments are dorsally carinate, the carinæ of the third, fourth, and fifth are posteriorly produced to spines, the sixth segment, although the longest, is comparatively short, it is without carina, its postero-lateral margin bears a long, lobed spine projecting over the base of the telson, and there is a small one at the posterior angle: the posterior margins of the segments are well rounded below, and the fifth has a spine on the oblique margin and another small one below it at the angle.

The telson is much longer than the sixth segment of the pleon, it is arched above, narrow, with two strong terminal spines, with a very small median tooth between them, it narrows rather more abruptly near the end, there is one small spine on each margin just above the end, and above them near the point of greater contraction one on each side, also marginal. These may be the representatives of the usual, quadrately placed spines, but they are not in the usual positions.

The rostrum is rigid, as long as the carapace, it is a little elevated distally and tapers to an acute point, its dorsal and lateral ridges are well marked, especially the latter, which extend for a short distance behind the orbits; on each side of the dorsal ridge there is a slight groove, a strong keel below bears five teeth, the more distal ones very remote; it is scantily setose between the teeth.

The ophthalmopods are rather short and thick.

The antennules are short; the peduncle is about one-fourth the length of the rostrum, the first joint is excavate above, its stylocerite spine being very strong and reaching well in advance of the end of the joint, the second and third joints are subequal in length, rather swollen above, together they are shorter than the ophthalmopod, the upper flagellum reaches rather more than half the length of the antennal scale, the lower one is a little longer than the scale.

The antennal scale reaches about two-thirds the length of the rostrum, it is broader than is usual in the other species, and is strengthened by two longitudinal ridges above, the distal spine is terminal, the external spine on the second joint of the peduncle is strong, and above it at the base of the scale there is an acute projection. The remaining joints of the peduncle are nearly one-fourth the length of the scale. The flagellum is slender and long.

The third maxillipeds reach nearly to the end of the antennal peduncle, of the three joints, the distal portion of the first, the second, and third are slightly excavated on their upper expanded surfaces, the third joint is acuminate distally, with a strong terminal spine, four others on the outer side and two or three on the inner; between the spines are very short teeth, the joint also along with the second is strongly setose on the inner side.

The first pereiopods resemble those of *A. robusta*, as also do the second, except a peculiar bend at the junction of the basis joint with the ischium, and there is only one spine on the ischium.

The third and fourth pairs are robust and long, the meri bear two spines below near the distal end, and are fringed with plumose setæ, the carpi are short and expand well distally, the propodi taper a little and are well spined on their posterior margins, the dactyli are short, little curved, and have two strong claws.

The fifth pair are rather less robust, the merus having only one spine. The pleopods are well developed, the rami subequal in length.

The uropods are rather narrow, as long as the telson.

The ova are small and numerous.

Length, excluding rostrum and telson, 28 mm.

Length of carapace, 13 mm.

Dredged by Dr. Verco, S.A. coast, about 20 fathoms.

Types, two, in Adelaide Museum.

Another species obtained belongs to the genus *Alope*, of the family *Hippolytidæ*, and is related to a species, *Alope palpalis*, White, which is figured in the zoology of the Erebus and Terror, Crust., pl. iv., fig. 1, and for a long time was imperfectly known until recently redescribed by Mr. G. M.

Thomson, of Dunedin, in Trans. Lin. Soc., 2nd series, vol. viii., pt. ii.

The present species differs from *A. palpalis* mainly in its smaller size, its non-expanded carapace, its less robust third maxillipeds, in the less divided state of the second pereiopods —except the carpus—and in many other minor particulars.

I am not aware of there being known any other species of this genus, so I take the liberty of slightly modifying Mr. Thomson's presentation to include the present species.

Tribe, CARIDEA.

Family, Hippolytidæ.

Genus, **Alope**, *White*, 1847.

Carapace smooth, with supra-orbital spines and suborbital teeth.

Rostrum short, armed with teeth above and springing from a deep groove.

Ophthalmopods short, stout, ocelli well developed.

First antenna short, with two flagella.

Second antenna with large scale (scaphocerite) and long flagellum.

Mandible with shortened or almost obsolete cutting plate, and three jointed palpi.

First maxilla two or three branched.

Second maxilla three branched with wide mastigobranchial plate.

First maxilliped with two lobed mastigobranchia.

Second maxilliped with short podobranchial plume.

Third maxilliped very long and pediform, without branchia.

First pereiopod strong, chela well developed.

Second pereiopod slender, long, minutely chelate, carpus seven-jointed.

Telson moderately narrow.

Third to fifth pereiopods with two clawed dactyli.

Pleurobranchiæ, five.

Podobranchia, one, on the second maxilliped.

Alope australis, *n. sp.* Pl. xxx., figs. 1-7.

Body smooth, white, with many very small red spots, short and robust. Carapace not carinated dorsally or swollen, but slightly narrowing anteriorly. The two long, supra-orbital spines are connected dorsally by a U-shaped ridge, in the fork of which is a small, broad-based spine, and immediately in front of this spine in a depression arises
ridge, in the fork of which is a small, broad-based spine,

eyes, acute, slightly depressed, with lateral ridges, acuminating on all sides, with five forward directed spines above, entire below, with the apex a little laterally constricted. Laterally from the supraocular spines a ridge is continued on each side in a curved manner to a prominent antennal spine. This ridge forms the posterior margin of a lunate depression (half of the depression which the rostrum divides), and its anterior margin is excavated to receive the eye peduncle. The antero-lateral angles are rounded, and the remainder of the lateral margins of the carapace are fringed with short hair.

The pleon is not carinated or geniculate, it narrows regularly in the transverse direction after the second segment. The pleura of the three anterior segments are moderately deep, those of the first overlapping the carapace, those of the second the first and third, though not extensively. The sixth segment is shorter than the two preceding ones together, and about as long dorsally as the third; on its posterior margin it bears two triangular spines, which project each side of the telson, the posterior angles are acute, but do not project as far as the above spines, the sternal surface has an obtuse preanal lobe.

The antennular peduncle reaches to about the middle of the antennal scale, the basal joint is much expanded and excavate above, and reaches well beyond the eyes, the stylocerite spine, which is not deeply cut from the body of the joint, reaches a little beyond the end, there is a small lobe at the inner proximal end, and a tuft of plumose setæ near the distal end above, the second and third joints are subequal in length, and are together shorter than the first, each three joints has distally and above a little transverse comb of short spines and below the first and second bear tufts of plumose setæ, the upper flagellum is stout, and subequal in length to the peduncle, the lower is slender and about twice as long. The ophthalmopods are stout and short, ocelli join the pigmented portion above.

The antennæ have moderately broad scales, which only slightly narrow distally. The external distal spine is well below the apex, there is a small external spine on the outer side of the second joint of the peduncle, and a group of plumose setæ on the third joint on the inner side, the fifth joint has distally a tuft of rather rigid plumose setæ, this joint reaches about two-thirds the length of the scale, the flagellum is strong, and nearly as long as the animal's body.

In the mandible the cutting plate is extremely rudimentary; the molar process is strong and very deflexed, there is a three-jointed palp, the basal joint of which is expanded and produced at the outer angle.

The first maxilla is three-lobed, the outer branch bifid, with one or two long setæ on each division.

In the second maxillipeds the exopod is very large, the last two joints of the five-jointed endopod deflexed.

In the third maxillipeds the endopod is very long, reaching forwards as far as the lower flagellum of the antennule, the three joints are well beset with hairs. The first joint is longer than the third, the second about one-third the length of the third, the third is more vertically compressed, slightly curved and a little tapering, very hairy on the inner side, as also is the second, with four or five strong, divergent spines at the end. The exopod is very small.

The first pereiopods are moderately strong. Both merus and carpus are distally excavate to receive prominences of the succeeding joints, which are articulated at their inner proximal angles. The palm is smooth and scarcely compressed, with a slight longitudinal sulcation on the inner side, the fingers are a little more than half as long as the palm, they are curved and are distally cut into two or three corneous teeth, and are setose on their apices and margins, and excavate, the carpus and palm together are subequal in length to the ischium and merus together. The merus has a row of small teeth at the outer distal end, and the margin of the cup-like carpus has—besides the shallow one at the articulation of the palm—two deep insinuations near the margin, on the inner side there is a row of pectinate setæ.

The second pereiopods are long and slender. The carpal joint is divided into seven, the first four become successively shorter, the fourth, fifth, and sixth are subequal in length, the seventh about as long as the third, the palm is a little longer than the seventh division of the carpus, the fingers are half as long as the palm, the ischium and merus together are subequal in length to the succeeding joints together, the merus is a little longer than the ischium, and together they form a slight curve. The end of the last joint of the carpus has a pencil of long bristles, and some are situated on the fingers.

The following three pairs of pereiopods are moderately stout, the last pair a little weaker, they are sparely spined, the ischi and meri together are stouter and subequal in length to the succeeding joints, the carpi are slightly curved, the propodi slightly compressed and a little curved; the dactyli are strong, curved, with two strong claws, and a few spines inward from them.

The pleopods are well developed, the rami subequal. The uropods have moderately broad rami, the external one has a tooth and articulated spine, with a sinuate division somewhat distant from the end, the outer margin is straight.

The inner ramus is ovate-lanceolate and as long as the outer both are elegantly fringed. The telson is shorter than the uropods, tapering, with a shallow median sulcation and the usual quadrately placed spines, and a fasciculus of setæ near the proximal end above; it terminates in five teeth and two spines, and is fringed to about halfway up the sides.

The ova are small and numerous.

Length from base of rostrum to base of telson, 27 mm.

Length of carapace, 10 mm.

Obtained in shallow water at Smith's Bay, Kangaroo Island, by R. Baker, January, 1903.

Type specimens, two, in Adelaide Museum.

A sixth species is unique; a female found by Mr. Zietz amongst Dr. Verco's dredgings from 20-30 fathoms. It belongs to the family *Crangonidæ*, of the same tribe as the preceding, and is related to both the genera *Pontophilus* and *Sabinea*, with tendencies towards *Pontocaris*, but I am of opinion that it requires to be placed in a new genus, mainly for the following reasons:—First, the shape of the body and the relationship of the parts, though the cephalo-thorax is not so long, it is quite as bulky as the pleon; secondly, the peculiar position of the eyes, their distance apart and sessile character; thirdly, though the second pereiopods are reduced in length and non-chelate, they are still comparatively strong, and reach as far as the carpus of the first pair; fourthly, the telson is broad and more *Alpheus*-like than in any figures of other species of the same family I have seen; unfortunately, I am not able to state whether the branchiæ are six or seven.

Tribe, CARIDEA.

Family, Crangonidæ.

Genus, **Vercoia**, *n. gen.*

Body short.

Carapace deep, as long as the first four segments of the pleon, little compressed laterally, broad, produced at the antero-lateral angles, its lower margin making an obtuse angle about the middle.

Eyes distant, large, on very short peduncles, which are hidden by the cephalic portion of the carapace, in distinct orbits formed above by that portion of the carapace and below by the produced antero-lateral regions, and anteriorly by processes of the antennules.

Rostrum shaped as is usual in *Pontophilus*, placed far in advance of the eyes.

Antennular peduncles very short, much hidden by the cephalo-thorax, the joints with external lateral expansions, that of the first completing the orbit in front.

Antennal scales short, feeble, subtriangular, without distal spines, flagella short.

Third maxillipeds long, the distal joints vertically compressed.

First pereiopods robust.

Second pereiopods non-chelate, shortened but rather robust, reaching as far as the carpal joints of the first, carpus and propodus together about as long as the merus.

Third pereiopods styliform.

The pleopods have much expanded peduncles, which become faced outwards in the female, the rami are curved, especially the inner.

The uropods and telson are short, the telson broad, rounded at the end, and ciliate, but not spined.

There is a ridge on the ventral surface between the first and second pairs of pereiopods, terminating anteriorly in a projecting spine between the first pair.

Vercoia gibbosa, *n. sp.* Pl. xxxi., figs. 1-4.

Body short, very much depressed at the first segment of the pleon, gibbous and much sculptured with many obtuse prominences, but no spines. Carapace of rigid consistence, deep, dorsal surface broad, rather depressed, consisting of a shield-like platform, which occupies nearly the whole length; this is rather excavate in the gastric region, and anteriorly and medianly bears the short, slightly excavate, and entire rostrum. Laterally from the rostrum on each side is a lobe, slightly insinuated on the margin projecting in front of the eye, and forming the upper anterior part of the orbit. The lateral margin of the platform on each side is marked first by a small tooth immediately over the eye, then by a short, slightly sigmoid, detached ridge, and behind this a short, straight ridge beginning abruptly. The posterior boundary on each side of the median line consists of a small, incurved, oblique ridge, and behind these a pair of longer, converging ridges, forming together a broad V, the apex of which reaches close to the posterior margin of the carapace. The surface of the anterior or gastric portion of this platform is smooth, but the cardiac portion has medianly a longitudinal ridge, divided into three portions—or obtuse carinæ, the most anterior part of which is short and low—not visible from a side view, the second and third portions are strongly elevated, the third being declivous behind towards the posterior margin of the carapace; on each side of the middle portion is a short, transverse, scale-like ridge. The antero-lateral angles of the carapace are produced considerably in advance of the eyes to near the bases of the antennal scales, from them on each side an oblique ridge extends backward and

slightly downward, for about half the length of the carapace, and between this hepatic ridge, which is very pronounced, and the lateral margin is another faintly marked, which bifurcates behind and soon disappears. The lateral margin of the carapace forms an obtuse angle immediately over the base of the third pereiopod. Posterior to these ridges and higher up is another short, oblique ridge, divided into two anteriorly abrupt portions, and higher still and more posterior there is a short, slightly sigmoid ridge, whose end reaches close to the posterior margin of the carapace, and in the postero-lateral region there are two short, slightly oblique ridges with very obtuse anterior ends. These have a few faintly marked, scale-like projections preceding them. The antenal and hepatic regions also have a few short, scale-like projections, viz., one a little below and behind the eye, with two or three more higher up about the middle of the carapace, and one or two on the antennal region.

The pleon narrows considerably after the third segment both laterally and vertically, it is much sculptured, and the second and third segments are strongly humped in the middle line. The first segment is very short, and very slightly overlaps the carapace. The three posterior segments also are short and broadly but not deeply keeled dorsally, they are marked with one or more scale-like ridges on the sides; the second and third are more sculptured above and at the sides than the others, and are only moderately produced at the sides. The sixth segment is longer than either of the two preceding ones, it is much overlapped at the sides by the fifth, and ventrally has a broad, preanal lobe bearing two acute prominences.

The telson is a little longer than the sixth segment, it is rather broad, especially at the base, medianly sulcate above, rounded at the distal end, and ciliate, but not spined, dorsally there are two scales on each side of the median sulcation, occupying the place of the usual quadrately placed spines.

The appendages are mostly short.

The eyes are as stated above.

In the antennules the first joint of the peduncle is hidden under the carapace except its lateral lobe. The peduncle does not extend much further than the rostrum. The upper flagellum does not reach as far as the antennal scale, the lower one is very small.

The antenna arises in a recess of the anterior margin, its scale has a small triangular process situated near its base on the upper surface. The distal peduncular portion is scarcely more than half the length of the scale, the flagellum is slender and very short.

The third maxillipeds project well in advance of the scales of the antennæ, the last two joints are broad and fringed with short setæ. The antepenultimate joint has a short distal keel below.

The first pereiopods are sub-chelate, they are capable of reaching as far forwards as the maxillipeds, the merus is much compressed, the carpus very short, and its distal margin is divided into lobes, the carpus and palm are together about equal in length to the ischium and merus together. The palm is robust, about twice as long as broad, swollen much proximally—on a side view—with a strong spiniform pollex and moderately strong dactylus.

The second pereiopods are short, non-chelate, not very weak, reaching nearly as far as the carpus of the first, the terminal joint is small and acute, the penultimate joint bears a small distal spine in the position of a pollex, the limb is slightly setose.

The third pereiopods are very slender, styliform, with the terminal joint very acute, it reaches forward nearly as far as the antennal scale. The next two pairs of pereiopods are robust, very sparingly setose, with strong, simple dactyli. The four anterior pairs of pleopods are short, with very broad peduncles presented outwards. The rami are curved and foliaceous, the inner ones falcate.

The uropods are short and rather weak, the outer ramus is subtriangular, without a division, and with a very small external spine, the inner ramus is ovate and narrower.

The ova are large and few.

Length, excluding rostrum and telson, 14 mm.

Length of carapace, 6 mm.

Type, one female, in Adelaide Museum.

DESCRIPTIONS OF PLATES.

Plate XXVII.

Fig. 1. *Angasia elongata*, n. sp., enlarged.
Fig. 2. Third maxilliped of same, enlarged.
Fig. 3. First pereiopod of same, enlarged, outer view.
Fig. 4. Second pereiopod of same, enlarged.
Fig. 5. *Angasia kimberi*, n. sp., enlarged.

Plate XXVIII.

Fig. 1. *Angasia robusta*, n. sp., enlarged.
Fig. 2. Third maxilliped of same, enlarged.
Fig. 3. Telson of same, enlarged.
Fig. 4. Opthalmopod, antennule and antennal scale of same, enlarged.
Fig. 5. Rostrum of same, enlarged.
Fig. 6. Mandible of same, enlarged.
Fig. 7. First pereiopod of same, inner view, enlarged.
Fig. 8. Second pereiopod of same, enlarged.

PLATE XXIX.

Fig. 1. *Angasia tomentosa*, n. sp., enlarged.
Fig. 2. Third maxilliped of same, enlarged.
Fig. 3. First pereiopod of same, inner view, enlarged.
Fig. 4. Second pereiopod of same, enlarged.

PLATE XXX.

Fig. 1. *Alope Australis*, n. sp.
Fig. 2. *Alope Australis*, frontal parts of same, much enlarged.
Fig. 3. *Alope Australis*, first pereiopod of same, much enlarged.
Fig. 4. *Alope Australis*, mandible of same, much enlarged.
Fig. 5. *Alope Australis*, under side of antennal peduncle of same, much enlarged.
Fig. 6. *Alope Australis*, second pereiopod of same, enlarged.
Fig. 7. *Alope Australis*, uropods and telson of same, much enlarged.

PLATE XXXI.

Fig. 1. *Vercoia gibbosa*, n. sp., lateral view.
Fig. 2. *Vercoia gibbosa*, dorsal view.
Fig. 3. *Vercoia gibbosa*, frontal parts of same, much enlarged
Fig. 4. *Vercoia gibbosa*, second pereiopod of same, much enlarged.

Descriptions of Some New Species of Orthoptera from North-Western South Australia.—No. 1.

By J. G. O. Tepper, F.L.S., F.S.Sc.

[Read June 7, 1904.]

Plate XXXII.

The species described form part of a small collection made by Mr. Herb. Basedow, as one of the members of an exploring expedition under the command of Mr. L. A. Wells. This part of the country had been rarely traversed, and no insects had been collected there previously. The expedition left Adelaide in March, 1903, and returned in the following November.

Order, ORTHOPTERA.

Family, BLATTARIÆ.

Periplaneta Basedowi, *sp. nov.* Plate xxxii. (three females in good condition).

Ochraceous, shining, size large.

Head with impressed minute dots; a round pale spot at the base of the antennæ and separate from them and the eyes; face with faint, dark spots in transverse rows. Antennæ brownish, very slender, as long (or nearly so) as the body. Pronotum transverse, elliptical, with subangular, subsemilunate, brownish impressions. Meso.- and metanotum paler marked; scutellum elongate-triangular, promiscuous. Elytra as long as or longer than the wings, deep black, shining; anal vein and transverse veinlet very fine, pale. Wings much longer than the body, anterior area and the veins of the posterior deep black; transverse veinlets pale, membrane between them greyish. Legs shorter, but stouter than those of *P. americana;* concave surface (under the femora) of the coxæ with small raised granula; femoral spines few and slender; middle and hind femora with about six strong spines in each row; tarsi short, glabrous. Abdomen ovate, compressed, thin, rugulose, with a submarginal row of small, dark spots; hind margins of segments above and beneath broadly darker; posterior angles of penultimate segment alone produced; supra-anal lamina subrotundate, depressed; scarcely twice as long as the lamina; subgenital lamina emarginate, very short and slender.

Length of body, 25-28 mm.
Length of pronotum, 8 mm.
Length of elytra, 30-33 mm.
Length of wings, 25-27 mm.
Width of pronotum, 11-12 mm.

The bright-coloured pronotum and legs contrast most conspicuously with the deep lustrous black tint of the elytra, and render this species the handsomest of the Australian species and of the genus, and I have much pleasure in dedicating it to the assiduous collector as a slight mark of esteem.

MANTODEA.

(?) PSEUDOMANTIS PULCHELLUS, *sp. nov.*

Female. Pale brownish grey to pale brown (abdomen). Head transverse, extremely compressed, pale grey; eyes very large, a darker band with parallel borders over the middle, and continued over the ridge of the head; front with three minute tubercles in place of ocelli. Antennæ missing. Prothorax smooth above, very elongate and slender, slightly dilated anteriorly; margin densely and finely spinulose; a narrow pale transverse line before the middle of the dilatation, anterior to which an elongate, gradually attenuated depression extends about halfway towards front margin, posteriorly a distinct median ridge extends continuously to the hind margin of the metanotum. Meso.- and metanotum pale, subequal. Elytra longer than the wings, thinly membranous, pale brownish; fore margin, anal area, and a large round discal spot whitish; apex obtuse. Wings subrotundate, frontal area rosy with brownish apex, remainder opaque, deep bluish black, with a few linear transverse streaks anteriorly; apex brown, with a narrow white border. Forelegs elongate; coxæ unarmed, external keels whitish; femora with four spines externally and numerous spinelets internally; a very long spine followed by two much smaller ones obliquely opposite to the last external; tibiæ multispinulose, and a long spur. Middle and hind legs very long and slender, unarmed. Abdomen subcylindrical, slightly attenuated towards extremity, not dilated; supra-anal lamina triangular, equilateral, subacute; lateral lobes subtriangular, whitish; cerci slender, not, or scarcely, extending beyond the lobes; anal appendages forming two small, acute spines.

Length of body, 52 mm.
Length of head, 1 mm.
Length of pronotum, 13 mm.
Length of elytra, 11·5 mm.
Length of wings, 9 mm.
Length of hind femora, 17 mm.
Width of head, 4 mm.
Width of elytra, 3 mm.
Width of dilatation, 2·75 mm.

It is with some diffidence that I place this species in the genus it is assigned to, it apparently not agreeing exactly

with any I have descriptions of; but not having the male (perhaps akin to *P. Kraussiana*, Sauss.), the creation of a new genus appeared inadvisable. In the form and colouration of elytra and wings it seems to approximate the African genus *Danuria*.

ACRIDIDÆ.

CORYPHISTES CYANOPTEROIDES, *sp. nov.*, 2 (male and female).

Resembles *C. cyanopterus*, Charp., but is darker and larger; dull brownish-grey. Fastigium very prominent, nearly parallel-sided, apex abruptly rounded. Eyes large, dark reddish-brown. Antennæ ensiform, joints gradually diminishing in width from the third. Ocelli inconspicuous, brown. Head with a fine medial ridge from near the apex of the fastigium, and continued to the hind margin of the pronotum; dark lateral parallel-sided bands, bordered above narrowly white, from the inferior part of the eyes, and continued to the hind margin of the pronotum, the space between the bands marbled with black. Elytra pale brown, veins much darker, a few blackish streaks adjoining the base of the humeral and near the middle of the anal vein; transverse veinlets very numerous, mostly pale, but bordered mostly and capriciously deep black or brown. Wings with costal area smoky brown (mas.), or blackish (fem.), veins and veinlets much darker; remainder much paler, basal and anal part pale blue. Fore and middle legs slender, body colour; hind femora strong, base not very tumid, unarmed, inner side wholly black (mas.), or more or less purplish (fem.); hind tibiæ pale greyish externally, remainder rosy-purplish; with two rows of ten spines above, the external ones black and much the larger. Abdomen grey or brown, banded dark brown or blackish (mas. and fem.); cerci conical, very short.

Length of body, 45-47 mm.
Length of antennæ, 14-15 mm.
Length of pronotum, 10-12 mm.
Length of elytra, 48-50 mm.
Length of hind femora, 21-22 mm.
Length of hind tibiæ, 18 mm.

This species is widely distributed in South Australia, and has been usually included under Charpentier's name, *C. cyanopterus*. From this species it differs by the much more prominent and angular fastigium, general colouration, and other characters. It inhabits forests and woods sparingly, and is slow to take to flight. Its colour appears to be highly protective, inasmuch as it agrees more or less perfectly with the tints of the trunks of trees, etc., upon which it rests, or settles when disturbed.

CORYPHISTES SERRATUS, *sp. nov.*

Female. Brown, variegated with grey and black. Head large; eyes oval, metallic golden-bronze. Fastigium wide above, concave, blackish, keeled, emarginate, contracted into a narrow ridge in front below the apex between the antennæ, then again gradually diverging and terminating rotundately beyond the ocellus. Lateral ocelli large, black, midway between the eyes and the antennæ. Occiput, sides and underside of head, also the sternum yellowish-grey; a low median ridge and an impressed, curved black band from the base of the fastigium on either side to the base of the head. Antennæ blackish, apparently with 18 joints; basal joint short, stout; joint 2 still shorter, thinner, cup-shaped; remainder much longer, subcylindrical, gradually diminishing in size to apex; from the third with a broad membranous border, forming alternately larger subtriangular lobes, with rounded hind margin to near the apex. Pronotum black, with numerous pale striæ bordering the fore and hind margins, and pale round granulations scattered over the rest, fore margin emarginate, hindmargin rounded. Elytra pale grey, acute, the extremely numerous longitudinal veins and transverse veinlets bordered dark brown. Wings with basal area tinged pale greenish, shading into brownish along anterior costa and towards apex, costal veins and veinlets dark brown, remainder pale. Legs mottled blackish and brown, fore and median ones short, underside and internally more or less densely pilose, tibiæ with a few minute spinelets along the inner ridge. Hind femora strong, upper ridge minutely spinose, lower ridge with nine larger spines, and hairy between; discal ridges spinulose; internal side smooth, crimson with broad transverse black markings; lower genicular lobes very long, narrowly lunate, as long, or longer than, the width of the joint. Hind tibiæ slender, mottled brown and blackish, inner side black and crimson; external upper ridge with eleven acute conical spines, internal with nine, space between densely pilose; spurs very small. Tarsi thinly hairy; claws oppositely divergent; pulvillus large. Abdomen blackish brown above, pale beneath. Cerci mutilated. One female.

Length of body, 41 mm.

Length of antennæ, 18 mm.

Length of pronotum, 10 mm.

Length of elytra, 50 mm.

Length of wings, 45 mm.

Length of hind femora, 26 mm.

Length of hind tibiæ, 22 mm.

The remarkably and prominently keeled fastigium, broad serrated antennæ, markings of the pronotum, and armature of the hind femora and tibiæ, also the elongated curved genicular lobes, appear to render this a well-marked species, and, perhaps, with the following the type of a subgenus.

CORYPHISTES NIGROCONSPERSUS, *sp. nov.*

Male and female. Smoky brown; in general form resembling preceding. Head pale (mas.) or dark (fem.) brown. Fastigium blackish, subrectangular above, separated from occiput by a more or less distinct furrow; distinctly keeled only towards apex, in front contracted to an obtuse ridge, then expanding between the antennæ forms a distinct callosity, with the ocellus in the central depression, the distinct (mas.) or indistinct (fem.) sinuous lateral ridge extending to the margin of the face. Occiput and sides of head nearly smooth, dull; a narrow black median stripe from base of fastigium to pronotum, a slightly curved, irregularly bounded brownish band on either side above; laterally a broad, parallel-margined black band from the base of the antennæ, interrupted by the lower part of the eyes, and a narrow black submarginal, more irregular one, starting conjointly with the former. Eyes oval, dark bronzy-brown; lateral ocelli rather small, bright brown, adjoining the lower border of an elongate black spot on the side of the fastigium. Antennæ dark brown, mottled paler, ensiform; marginal lamina very thin, basal joint subconical, joint 2 very short, not much thinner than the first; joint 3 over three times longer than the preceding together, triangular, broad; joints 4-7 quadrate, angular, subequal; joints 8-9, 10-11, 12-13 successively narrower, longer than wide, quadrangular; joint 14 half as wide as preceding, remainder gradually diminishing in dimensions, last ones very minute. Pronotum darker than the head, almost smooth, rounded in front and behind, with a few minute tubercles above and two broad pale stripes to posterior transverse furrow, also the black cephalic stripes more or less distinctly continued to the hind margin. Elytra ochreous-brown, with numerous small spots scattered over all; apex obtuse. Wings pale greenish-brown; veins and veinlets dark, not bordered. Legs, also face and underside, more or less beset with brown hairs. Fore and middle legs unarmed. Hind femora stout, as long, or longer than, the body; external genicular lobes moderately long, curved, gradually narrowed to the subacute apex; internal lobes large, subquadrate; external ridges minutely spinose, densely hairy above; discal area white (mas.) or pale ochreous (fem.), with 16 black, narrow,

angulate, transverse bands; internal area blackish and purplish; hind tibiæ with two rows of 9-11 large acute spines, besides 4 curved spurs, space between densely hairy. Tarsi long; claws and pulvilli small. Abdomen stout, smooth, shining, and ending with 6 small black spines.

Length of body—Male, 45 mm.; female, 52 mm.
Length of antennæ—Male, 17 mm.; female, 21 mm.
Length of pronotum—Male, 11 mm.; female, 15 mm.
Length of elytra—Male, 43 mm.; female, 47 mm.
Length of hind femora—Male, 24 mm.; female, 28 mm.
Length of hind tibiæ—Male, 20 mm.; female, 25 mm.

There is a specimen of each sex, and fairly well preserved. The female differs from the male, besides size, only in the markings being less distinct and some occasionally obsolete. The species is a well-marked one, and new to the Museum collection.

GRYLLACRIDÆ.

GRYLLACRIS ATROFRONS, *sp. nov.* (fem.).

Size moderate, smoky-brown. *Face*, clypens and mandibles black, except large white ocelliform spot; sides of head brown; antennæ brown, base blackish; fastigium keeled. Pronotum above broadly and its hind margin entirely black, sides pale. Meso.- and metanotum blackish. Elytra and wings net-veined, pale brownish veins and veinlets deep brown. Femora above and externally dark, apices of middle and hind femora pale. Tibiæ with four small spines externally and internally, finely and shortly hirsute, black at the base, remainder pale; tarsi brownish, slender. Abdomen short, truncate, alternately pale and dark banded. Cerci slender, pale; ovipositor slightly curved, pale, apex darker, acute.

Length of body, 23 mm.
Length of pronotum, 4.5 mm.
Length of elytra, 39 mm.
Length of hind femora, 13 mm.
Length of ovipositor, 21 mm.

This species resembles *G. atrogeniculatus*, m., but is smaller and differs in the black face and top of head, large white ocelliform spot, keeled fastigium, and longer ovipositor, besides other characters.

Descriptions of New Species of Australian Elachistidæ, etc.

By Oswald B. Lower, F.E.S. (Lond.).

[Read June 7, 1904.]

TINEINA.

ŒCOPHORIDÆ.

Phlœopola sciaspila, n. sp.

Male, 12 mm. Head and palpi whitish, second joint of palpi with a blackish apical and a blackish lateral stripe on basal two-thirds, and blackish apical ring. Thorax white, irrorated with fuscous, anteriorly dark fuscous. Antennæ greyish. Legs greyish, posterior pair fuscous, tibiæ and tarsi banded with whitish. Forewings elongate, moderate, costa gently arched, termen obliquely rounded; white, finely irrorated with fuscous and with blackish markings; a basal spot in middle; a spot on costa at one-fifth; a second below and beyond; a third in middle beyond last two; an irregular elongate spot on costa at three-quarters; a short spot at end of cell, and another before and below; a darker suffused spot on costa at five-sixths, from which proceeds an oblique, fuscous shade towards anal angle; a few small, suffused dots along lower half of termen; cilia fuscous whitish, with a darker line below apex. Hindwings fuscous; cilia fuscous-whitish. A small species, distinct by the number of dots; the first four are very clear. Nearest *turbatella*, Walk.

Duaringa, Queensland. One specimen; in November.

Ocystola heliotricha, n. sp.

Male, 20 mm. Head, thorax, antennæ, abdomen, and legs black, antennal ciliations four. Palpi orange, terminal joint black. Forewings elongate, moderate, costa hardly arched, termen oblique; orange; a narrow black streak along basal fourth of costa, extended at base to inner margin, thence continued along inner margin and gradually dilated to beyond middle, thence broadly dilated to reach costa, and fill up rest of apical and terminal portions of wing, upper half slightly curved anteriorly; cilia orange, with a black spot at apex. Hindwings orange; a broad, black band along termen; cilia black.

Exceptionally distinct by the orange wings and black markings.

Tasmania (probably Hobart); one specimen; in November.

BORKHAUSENIA (?) ERYTHROCEPHALA, n. sp.

Female, 14 mm. Head pale red, face paler. Thorax dark fuscous. Antennæ dark fuscous (imperfect). Abdomen and legs pale ochreous, anterior legs infuscated. Forewings elongate, moderate, costa gently arched, termen oblique, apex pointed; dark fuscous, somewhat mixed with reddish, and minutely irrorated with blackish scales; cilia dark fuscous. Hindwings elongate, apex pointed; fuscous; cilia pale ochreous. Underside of *both* wings clothed with blackish scales.

A species of doubtful affinity, and doubtfully referred; the antennæ are imperfect, and the wings are more pointed than usual.

Broken Hill, N.S.W. One specimen; in April.

BORKHAUSENIA AMPHIXANTHA, n. sp.

Male, 14 mm. Head and palpi pale ochreous, base of second joint externally and terminal joint of palpi fuscous. Antennæ fuscous, obscurely annulated with pale ochreous. Thorax fuscous, patagia ochreous. Abdomen fuscous, legs fuscous, banded above with ochreous. Forewings elongate, moderate, costa gently arched, termen obliquely rounded; pale yellowish, with fuscous markings; a spot at base of costa; a thick suffused streak along fold throughout; a narrow streak along costa, interrupted near base, and before and beyond middle; a dot on fold in middle; a second on fold at two-thirds, both connected with costa by a narrow shade; dorsal portion of wing suffused with fuscous, except near base and middle; a moderate apical patch; cilia fuscous, slightly ochreous-tinged at base. Hindwings light fuscous; cilia as in forewings. Somewhat allied to *Sulfurea*, Meyr., and *Protoxantha*, Meyr., but differs from both by the narrow forewings and other details.

Melbourne, Victoria. One specimen; in April.

ELACHISTIDÆ.

BATRACHEDRA ZONOCHRA, n. sp.

Female, 10 mm. Head, palpi, thorax, antennæ, and abdomen pale greyish-ochreous, palp rather short, antennæ with strong pecten. Legs whitish, more or less banded with greyish-ochreous. Forewings elongate-lanceolate; pale grey-whitish, with rather obscure ochreous markings; a narrow transverse basal fascia; a second, similar, at about one-third; a third in middle; a more or less developed longitudinal streak in middle of wing, better developed, from posterior edge of third fascia to apex; a suffused patch at apex; containing a darker spot above anal angle; a narrow streak

along fold from beyond third fascia to below spot; cilia greyish, becoming fuscous tinged at base. Hindwings rather broadly lanceolate; grey; cilia five, pale greyish-ochreous.

Broken Hill, New South Wales. One specimen; in January.

BATRACHEDRA STENOSEMA, n. sp.

Male, 14 mm. Head, thorax, palpi, and antennæ ashy-grey-whitish, palpi whitish internally, antennæ obscurely ringed with fuscous, post-orbital rims whitish. Abdomen greyish-ochreous. Legs ashy-grey-whitish, posterior tibiæ and tarsi banded with dark fuscous. Forewings linear-lanceolate; ashy-grey-whitish, with blackish markings; a fine streak along fold; a second median, more or less interrupted, better developed on posterior half; a third, subcostal, only traceable on posterior half; an elongate spot on anal angle, some scales at apex; cilia grey. Hindwings very narrow, lanceolate-linear; grey; cilia grey-whitish.

Not unlike *Sterilis*, Meyr., but without the costal spots.

Broken Hill, New South Wales. One specimen; in April.

BATRACHEDRA (?) LYGROPIS, n. sp.

Female, 11 mm. Head dull whitish. Thorax fuscous. Palpi ashy-grey-whitish, internally whitish. Antennæ with moderate pecten, fuscous. Abdomen greyish. Anterior and middle legs fuscous, posterior pair whitish, tibiæ with two black bands, tarsi ringed with fuscous. Forewings elongate-lanceolate; ashy-grey-whitish, with fuscous markings; a moderately defined, flattened spot on fold just beyond middle, and a second similar on fold before anal angle; apical portion of wing slightly darker than general ground colour; cilia cinereous grey, terminal half grey. Hindwings lanceolate; dark grey; cilia greyish-ochreous.

Not unlike in general appearance *Artiastis ptochopa* (*Œcophoridæ*) Meyr.

Broken Hill, New South Wales. One specimen; in April.

BATRACHEDRA HYPOLEUCA, n. sp.

Female, 11 mm. Head, palpi, antennæ, thorax, and abdomen dull coppery-fuscous, abdomen beneath with broad whitish bands. Legs dark fuscous, posterior pair banded with whitish. Forewings elongate-linear; shining dark coppery-fuscous; cilia dark fuscous, becoming paler around anal angle. Hindwings fuscous, somewhat shining metallic; cilia dark fuscous on costa and around anal angle, greyish-ochreous on other portions.

Rather an inconspicuous species, but readily known by the whitish bands on under side of abdomen.

Broken Hill, New South Wales. One specimen; in October.

Calicotis microgalopsis, n. sp.

Male, 8 mm. Head, palpi, thorax, antennæ, abdomen, and legs shining snow white, posterior tarsi with whorls of long hairs at apex of joints, somewhat fuscous tinged. Forewings elongate, narrow; shining snow white; cilia snow white. Hindwings linear-lanceolate; white; cilia white.

Mackay, Queensland. Two specimens; in November.

The species is tolerably common, but owing to the active flight, and habit of falling to the ground when disturbed, were difficult to obtain.

Stathmopoda trichopeda, n. sp.

Male, 9-10 mm. Head and thorax dark fuscous, with coppery metallic reflections, face whitish. Palpi pale ochreous, terminal joint infuscated. Antennæ fuscous-coppery, fillet brassy metallic, basal joint ochreous. Legs pale ochreous, posterior pair dark fuscous, posterior tibiæ with tufts of bristly hairs at joints. Abdomen ochreous-orange, segmental margins fuscous, paler beneath. Forewings elongate, narrow; bright orange; markings deep coppery purplish; a moderate streak along basal one-fifth of costa, at base extended to inner margin; an outwardly oblique blackish line from middle of costa to just beyond middle of inner margin, beyond which the rest of wing is deep coppery-purplish, with a suffused blackish blotch in middle, hardly separated from ground colour; cilia dark fuscous, Hindwings elongate-lanceolate; shining bronzy-ochreous; cilia orange, fuscous around anal angle.

Recalls species of *Calicotis* in general appearance.

Mackay, Queensland. Five specimens; in November. Appearing to frequent one of the *Leguminosæ*.

Stathmopoda holobapta, n. sp.

Male, female, 10 mm. Head and palpi shining ochreous-white, terminal joint of palpi more ochreous. Antennæ ochreous, basal joint whitish. Thorax yellowish-orange, with two or three metallic longitudinal stripes. Abdomen blackish above, beneath white, anal tuft ochreous. Legs whitish, fuscous tinged, anterior coxæ shining white, posterior legs with blackish tufts at extremities of joints. Forewings narrow elongate; orange-ochreous, with shining golden metallic markings; a streak along costa from middle to apex; a longitudinal streak from base of costa, above and parallel to fold, thence reaching costa again at apex; a short, oblique streak from base of costa to one-quarter inner margin; a narrow streak in middle of fold; cilia fuscous. Hindwings bronzy fuscous; cilia fuscous, at base dull orange.

Probably nearest *Cyanopla*, Meyr., but differs, especially by colour of head, face, and abdomen, and other details.

Melbourne, Victoria. Two specimens; in November.

AEOLOSCELIS AULACOSEMA, n. sp.

Male, female, 10-12 mm. Head and thorax brownish-ochreous. Palpi whitish, annulated with fuscous. Palpi white, ringed throughout with fuscous. Legs silvery-white, tibiæ and tarsi banded above with fuscous. Abdomen greyish. Forewings narrow elongate; brownish-ochreous; a narrow, curved, interrupted black, posteriorly whitish-edged fascia, from costa at one-sixth to inner margin at one-quarter; a small black whitish-edged dot above fold about middle, below which is a leaden suffusion extending to fascia, but widely interrupted in middle; two fine, white elongate, subcostal lines at three-quarters, only separated from each other by a narrow black streak; below the lower streak is a strongly marked line of black, from posterior extremity of which proceeds a fine white line along fold towards the white-edged dot, but suddenly obliquely deflected to inner margin beyond middle before reaching it; a fine white line along fold immediately below, edged above with its similar width of black; a rather large, conspicuous black dot at apex, edged with white; a short, erect, anteriorly whitish-edged black spot at anal angle; cilia greyish-ochreous, becoming fuscous around apex, with a sharp black basal line and apical tooth. Hindwings greyish fuscous; cilia greyish-ochreous.

Mackay, Queensland. Several specimens amongst dry grass; in November and December.

AEOLOSCELIS EUPHÆDRA, n. sp.

Male, female, 9-12 mm. Head, palpi, antennæ, and thorax shining snow-white, antennæ slightly ochreous-tinged, thorax anteriorly bright ochreous. Abdomen ochreous, segmental margins whitish, more pronounced beneath. Legs silvery white, more or less banded with ochreous. Forewings narrow elongate; shining snow white, with bright ochreous markings; three well-defined rather broad, transverse fasciæ, edges irregular; first close to base; second from before middle of costa to middle of inner margin; third obscure, from five-sixths costa to three-quarters inner margin, with a slight sinuation above middle on anterior edge; a narrow, light ochreous, irregularly-edged fascia along termen; cilia greyish-ochreous, becoming ochreous at base. Hindwings elongate-lanceolate; light fuscous; cilia pale ochreous.

Mackay, Queensland. Four specimens, at light; in November.

Aeoloscelis petrosarca, n. sp.

Male, female, 10-12 mm. Head, palpi, antennæ, and thorax pale fleshy-ochreous, palpi whitish internally. Abdomen ochreous, whitish beneath. Legs whitish, posterior pair greyish-tinged. Forewings narrow elongate; pale fleshy-ochreous; a strong inwardly oblique narrow white streak from costa at three-fifths to inner margin in middle, edged posteriorly narrowly with black, especially on upper two-thirds; a fuscous dot on costa at three-quarters, and another in anal angle, both anteriorly edged with white, indicating a second fascia; cilia pale greyish-ochreous. Hindwings narrow; greyish-fuscous: cilia grey.

Townsville, Queensland. Two specimens, taken on sea beach, somewhat worn, in April.

Aeoloscelis hemicroca, n. sp.

Male, female, 10-14. Head, palpi, thorax, and antennæ ochreous-yellow, somewhat brassy-tinged. Abdomen ochreous, segments dull silvery-white. Legs pale ochreous. Forewings narrow elongate; pale ochreous-yellow, somewhat tinged with brassy, deeper ochreous on basal half; a narrow leaden metallic subcostal streak from base to beyond middle, attenuated posteriorly; a similar line along fold, from base to anal angle; cilia ochreous, mixed with greyish. Hindwings narrow; pale fuscous; cilia as in forewings.

Rockhampton and Duaringa, Queensland. Three specimens: in November.

Pyroderces argyrozona, n. sp.

Female, 8 mm. Head and thorax fuscous-orange, face shining white. Palpi white, banded with blackish, second joint more whitish. Antennæ white, sharply annulated with black, except towards apex, where there are two obscure blackish bands. Legs grey-whitish beneath, anterior pair banded above with black, posterior pair broadly banded above with dull orange. Abdomen ochreous, fuscous on terminal half. Forewings lanceolate, with expansible tuft of long ochreous hairs beneath; yellowish-orange, with silvery metallic markings, mixed with whitish: a narrow basal fascia extended to one-sixth inner margin; a narrow oblique fascia from costa at one-sixth to one-third inner margin, more whitish than others; a broader oblique fascia from costa in middle to beyond middle of inner margin; a similar one from costa near apex to anal angle, both the last fasciæ are somewhat dilated on costa; a narrow streak along termen; cilia greyish-ochreous. Hindwings linear; light fuscous; cilia as in forewings, but more ochreous at base.

Nearest *Schismatias*, Meyr., but abundantly distinct.

Duaringa, Queensland. One specimen; in November.

LIMNŒCIA HETEROZONA, n. sp.

Female, 7 mm. Head whitish. Palpi whitish, narrowly banded with black. Antennæ whitish, annulated with fuscous. Thorax fuscous. Legs and abdomen greyish, posterior legs more whitish, irregularly banded with black. Forewings elongate-lanceolate; blackish, with white markings; three equidistant transverse fasciæ: first from costa at one-sixth to inner margin at one-sixth, inwardly oblique, somewhat obscured on inner margin; second slightly broader and distinct, from costa in middle to inner margin in middle, but hardly reaching it; third from five-sixths costa to anal angle, obscure on lower half, and somewhat cuneiform on costa; cilia dark fuscous, mixed with blackish at base around apex. Hindwings narrow, linear at base; fuscous; cilia light fuscous.

Duaringa, Queensland. One specimen; in November.

LIMNŒCIA ISODESMA, n. sp.

Male, 14 mm. Head and palpi whitish-ochreous. Antennæ and thorax dark fuscous. Legs whitish, banded with fuscous, coxæ more whitish. Abdomen fuscous, anterior segments ochreous-tinged, beneath fuscous, ringed with whitish. Forewings elongate-lanceolate; dark fuscous, somewhat purplish shining; three equidistant, transverse, moderate whitish-ochreous fasciæ, from costa at one-fifth, beyond middle, and three-quarters respectively, all direct and reaching inner margin; cilia dark fuscous. Hindwings dark fuscous. Hindwings elongate-lanceolate; pale fuscous; cilia greyish-ochreous.

Easily known by the three equidistant fasciæ.

Melbourne, Victoria. One specimen; in November.

LIMNŒCIA ANISODESMA, n. sp.

Female, 18 mm. Head and palpi ochreous-white, antennæ and thorax fuscous, antennæ finely annulated with whitish, and with a broad whitish band beyond middle. Legs fuscous, banded with whitish, posterior pair somewhat ochreous tinged. Abdomen ochreous-fuscous. Forewings elongate-lanceolate; dark purplish-fuscous, somewhat iridescent; a broad whitish-ochreous fascia, from costa at one-sixth to one-sixth inner margin, posterior edge slightly curved outwards; a narrow transverse ochreous-white fascia, from costa beyond middle to inner margin at three-quarters; a nearly straight similar streak from costa at five-sixths to anal angle, narrowed on lower half, and almost cut in middle by a streak of ground colour; cilia dark fuscous. Hindwings elongate-lanceolate; dark fuscous; cilia fuscous; greyish at base.

Somewhat allied to the preceding, but the broad anterior fascia distinguishes it at once from that species.

Melbourne, Victoria. One specimen; in March.

SYNTOMACTIS DECALOPHA, n. sp.

Male, 12 mm. Head, palpi, antennæ, and thorax ashy-grey-whitish, terminal joint of palpi with three blackish rings, basal joint with two; antennæ annulated with fuscous, obscure on terminal half. Abdomen fuscous, beneath white. Legs white, tibiæ and tarsi obscurely banded with fuscous. Forewings elongate-lanceolate; light leaden fuscous, with ten black tufts of scales, anteriorly broadly edged with ferruginous-ochreous, posteriorly narrowly with whitish; a few small white marks along costa; first tuft on fold, near base; second obliquely above and beyond; third below fold at one-quarter; fourth above dorsum, about middle; fifth above and midway between third and fourth; sixth above dorsum at three-fifths from base; seventh subcostal, beyond middle; eighth, ninth, and tenth, small and inconspicuous, scattered between base and three-quarters; a small ferruginous fuscous spot on fold at three-quarters; a short fuscous subapical dash; cilia ashy-grey-whitish, mixed with greyish-ochreous on terminal half. Hindwings narrow-lanceolate, fuscous; cilia fuscous, mixed with ochreous towards lower half of termen.

Closely allied to *Argoscia*, but apart from the broader wings it differs, chiefly by the greater number of tufts, and absence of spots along costa.

Penola, South Australia. One specimen; in November.

SYNTOMACTIS ARGOSCIA, n. sp.

Female, 10 mm. Head, palpi, and thorax white, greyish-tinged, terminal joint of palpi with three black bands, second joint with two similar bands. Antennæ greyish, obscurely ringed with fuscous. Abdomen greyish-fuscous. Legs whitish, banded with fuscous. Forewings elongate-lanceolate; whitish, suffused with leaden fuscous along dorsum and apical third; tufts black, anteriorly ferruginous-edged, posteriorly narrowly whitish; one close to base below middle; three equidistant at one-fifth, two-fifths, and three-fifths respectively, basal two edged posteriorly more broadly with whitish; a fifth tuft on fold at one-third, and two or three small, indistinct ones above three-fifths; costal edge narrowly ferruginous-fuscous in middle; three or four costal ferruginous spots between posterior end of this and apex; some scattered elongate ferruginous marks in disc; a blackish elongate subapical streak; a rather sharply defined whitish line along termen; cilia fuscous-grey-whitish. Hindwings narrow lanceolate, fuscous; cilia light fuscous.

Probably nearest *tephras*, Meyr., but differs by the ferruginous markings and different arrangement of tufts.

Melbourne. One specimen; in December.

SYNTOMACTIS GNOPHODES, n. sp.

Female, 12 mm. Head, antennæ, thorax, and abdomen dark fuscous, head and face sprinkled with whitish. Antennæ obscurely annulated wth grey-whitish, abdomen beneath white. Palpi whitish, internally clearer, ringed with fuscous, somewhat obscure. Legs fuscous, posterior pair with tibiæ and tarsi banded with whitish. Forewings elongate-lanceolate; dark fuscous, mixed minutely with whitish, ferruginous, and fuscous metallic scales; tufts black; posteriorly finely edged with white, arranged in four transverse outwardly oblique series, the white posterior edging almost confluent, and thus tending to form narrow, thread-like fasciæ; first series of tufts close to base, rather obscure, followed on tornus by a moderate black tuft, finely edged with whitish; second series from one-third costa to one-third inner margin; third from three-fifths costa to about three-fifths inner margin; fourth from three-quarters costa to anal angle, a narrow black median streak from just before three-quarters to apex, cut by the fourth series of tufts; some white scales at apex, in which is placed a blackish spot; whitish scales along apical one-fifth of costa and along termen to anal angle; cilia dark fuscous. Hindwings and cilia dark fuscous.

Melbourne, Victoria. One specimen; in November.

SYNTOMACTIS PERINEPHES, n. sp.

Female, 18 mm. Head and thorax white. Palpi whitish, terminal joint with two fuscous bands, second joint internally fuscous, antennæ fuscous whitish. Abdomen fuscous. Legs white, somewhat infuscated. Forewings elongate-lanceolate; whitish, dorsal half fuscous; tufts blackish, somewhat ferruginous-edged, one near base below fold; a second on fold above and beyond, both small; a third transversely elongate, below fold at one-quarter; a fourth on fold, and a fifth on inner margin beyond middle; immediately following the last is a longitudinal streak of pure white, reaching anal angle, somewhat cuneiform; somewhat minute scattered scales of blackish on upper edge of dorsal streak; cilia fuscous. Hindwings and cilia fuscous; cilia purplish-tinged.

Melbourne, Victoria. One specimen; in November.

SYNTOMACTIS POLYCHROA, n. sp.

Female, 12 mm. Head, thorax, and antennæ white, antennæ annulated with fuscous, basal joint blackish. (Palpi

broken.) Abdomen fuscous, mixed with metallic coppery, beneath whitish. Legs whitish, banded with fuscous. Forewings blackish-fuscous; markings white; a broad basal patch, occupying basal third of wing, posteriorly limited by a nearly straight, blackish line; in the middle of patch is an obscure narrow fuscous transverse streak, obscure on lower half; an obscure outwardly oblique fascia on costa at two-fifths, reaching nearly half across wing; a somewhat quadrate spot on costa at three-quarters, reaching half across wing, more or less connected with lower edge of previous fascia, and enclosing an elongate-triangular spot of ground colour on costa; scale tufts metallic; three equidistant just above inner margin, between one-third and two-thirds; a whitish one at anal angle; two small ones above fold between first and second; second subcostal, on lower edge of fuscous triangular patch; cilia fuscous, mixed with ferruginous at base, and with an obscure whitish spot at apex; costal cilia blackish. Hindwings blackish-fuscous; cilia greyish-fuscous.

Melbourne, Victoria. One specimen; in December.

Syntomactis melamydra, n. sp.

Male, 8 mm. Head, palpi, antennæ, and thorax black. Abdomen grey, beneath with white segmental bands. Legs greyish, posterior pair blackish. Forewings elongate-lanceolate; dark fuscous, mixed with and some metallic scales: tufts black, anteriorly metallic; cilia dark fuscous. Hindwings narrow-lanceolate; pale fuscous; cilia fuscous. An obscure species.

Melbourne, Victoria. One specimen; in September.

Trachydora leucobathra, n. sp.

Male, 10 mm. Head fuscous, face snow-white. Palpi white, basal half of second joint black, terminal joint fuscous. Antennæ dentate, fuscous, anterior half white. Abdomen and legs black, abdomen more or less ringed with silvery white, more prominent beneath, legs banded with silvery-white, posterior coxæ silvery white. Forewings elongate-lanceolate; seven to costa; black with snow-white markings; four costal spots, first at one-eighth moderate; second largest at one-quarter; third and fourth close together, somewhat raised, at three-quarters; three minute subapical spots, arranged longitudinally; two large spots on inner margin, reaching nearly half across wing at one-quarter and beyond middle; tufts white anteriorly, black posteriorly, one below last two costal spots and nearly resting on inner margin, and two close together, transversely placed on middle of inner margin; cilia white, becoming black at apex and anal angle. Hindwings narrow-lanceolate; dark fuscous; cilia rather

dark fuscous. Easily known by the snow-white spots on the blackish ground colour, and whitish antennæ.

Cooktown, Queensland. One specimen; in April.

TRACHYDORA POLYZONA, n. sp.

Male, 10 mm. Head and palpi white, basal half of second joint fuscous. Thorax fuscous, anteriorly whitish, patagia white; antennæ dentate, with small pecten: fuscous-whitish. Abdomen ochreous, strongly margined, beneath fuscous, banded with silvery-white. Legs banded with fuscous, tarsi fuscous, ringed with white, posterior coxæ snow-white, anterior legs dark fuscous. Forewings elongate-lanceolate; fuscous, mixed with ochreous and black, with whitish markings; a short, moderately broad, oblique fascia from costa at one-sixth, reaching more than half across wing; a second, broader, from costa before middle, anterior edge distinct, posterior edge somewhat suffused into ground colour; a similar fascia on inner margin at one-quarter, anterior edge distinct, posterior edge somewhat suffused; another at anal angle, somewhat triangular; all the above markings are edged on either side with darker ground colour, especially those on inner margin; three minute subapical spots, arranged longitudinally; tufts anteriorly white, posteriorly fuscous; a small one at base of second costal spot; a second transversely double on inner margin in middle: a third above anal angle, and two others clear white and curved on costa at three-quarters; cilia white, becoming dark fuscous at apex and anal angle. Hindwings narrow-lanceolate; greyish-fuscous; cilia light fuscous, on basal half greyish-ochreous. Somewhat allied to the above, but distinct by the different coloured forewings, etc.

Mackay and Cooktown, Queensland. Two specimens; in March and April.

TRACHYDORA ZOPHOPEPLA, n. sp.

Female, 16 mm. Head, palpi, antennæ, thorax, and abdomen blackish-fuscous, second joint of palpi with tuft large, whitish internally on basal half, basal joint of antennæ whitish beneath, abdomen white beneath, ringed on sides. Legs fuscous-whitish, coxæ more whitish. Forewings elongate-lanceolate; dark fuscous, with some scattered, deep ferruginous and whitish scales, tufts moderate, dull whitish, anteriorly edged with blackish; two near base; another almost resting on inner margin at one-half; a second just above and beyond; third at two-thirds, larger, resting on inner margin; a fourth just above; a fifth just above anal angle, edged anteriorly by a sharp black streak, which is edged below with ferruginous; cilia dark fuscous, becoming darker on basal half, and with some scattered whitish scales. Hind-

wings narrow-lanceolate; bronzy-fuscous; cilia fuscous, greyish-ochreous basally.

Stawell, Victoria. One specimen; in October.

TRACHYDORA MOLYBDIMERA, n. sp.

Female, 10 mm. Head, palpi, antennæ, and thorax ashy-grey-whitish, palpi more whitish internally at base. Legs whitish, posterior pair fuscous. Abdomen dark fuscous, beneath white, anal tuft beneath white. Forewings elongate-lanceolate; dull fuscous-leaden, with somewhat metallic reflections; tufts rather obscure, somewhat leaden metallic, edged with ferruginous; one on inner margin before middle; another just above, both obscure; a third, ridge-like on inner margin at two-thirds; a fourth subcostal, above third; a fifth at three-quarters in middle of disc, edged with a sharp black streak above; a narrow fuscous line along fold; some black scales along termen and around apex; cilia fuscous. Hindwings narrow-lanceolate; dark fuscous, somewhat shining; cilia as in forewings.

Melbourne, Victoria. One specimen; in March.

TRACHYDORA ANTHRASCOPA, n. sp.

Female, 20 mm. Head, palpi, antennæ, and thorax black. Abdomen grey-whitish, two anterior segments dull ochreous, beneath fuscous. Legs fuscous, mixed with whitish. Forewings elongate-lanceolate; black; a thick, black streak along fold from base to three-quarters; several obscure short streaks on posterior half of wing; some white scales along termen and apical fourth of costa; tufts moderate fuscous; one on fold at one-sixth; a second above and beyond; a third on fold at one-third, and two others, one above and one below third; three others similarly placed at posterior end of streak, middle one beyond others; another at anal angle; cilia blackish. Hindwings dark fuscous; cilia dark fuscous; greyish at base. Allied to *capnopa*, Low., but much broader winged, with abdomen with yellowish anterior segments, and with hindwings and cilia darker.

I have another closely allied species from Penola, South Australia, but not in a fit condition for description.

Grafton, New South Wales. One specimen; in December.

TRACHYDORA CENTROMELA, n. sp.

Female, 24 mm. Head, palpi, and antennæ grey-whitish, basal joint of antennæ darker fuscous. Thorax and abdomen fuscous, abdomen beneath silvery-grey. Legs fuscous, posterior pair grey-whitish. Forewings elongate-lanceolate; grey-whitish, tufts grey-whitish, anteriorly blackish; a broad blackish well-defined longitudinal median streak from base to apex, broadest on posterior two-thirds; apex of wing in-

fuscated; about four equidistant tufts of greyish scales resting on lower edge of streak, between one-third and three-quarters; two subcostal, one before and one beyond middle; cilia dark fuscous, mixed with whitish and grey, at apex with a black streak, continued from longitudinal streak to extreme tip, slightly curved. Hindwings lanceolate, moderately broad; shining bronzy-fuscous; cilia fuscous, becoming dull ochreous at base, especially towards costa.

Stawell, Victoria. One specimen; in December.

TRACHYDORA MICROLEUCA, n. sp.

Female, 20 mm. Head and thorax whitish. Palpi ashy-grey-whitish, terminal joint with three oblique black bands, second joint with an oblique band of blackish near base, above which is a narrow white sharply defined band. Antennæ fuscous-whitish, reddish tinged beneath towards base. Abdomen dark fuscous. Legs whitish, suffused with fleshy red and fuscous, anterior and posterior coxæ fleshy-red. Forewings elongate-lanceolate; cinereous grey; a black streak along fold from base to before middle; a similar streak beneath costa from base to middle; veins towards termen finely and obscurely outlined with black; tufts posteriorly white, anteriorly fuscous; first on fold at one-third; second on inner margin before middle; third above fold at three-fifths; fourth below fold at three-fifths; fifth just above anal angle; cilia fuscous, mixed with white on basal half. Hindwings lanceolate; bronzy-fuscous; cilia fuscous. The reddish legs and whitish tufts of forewings are excellent distinguishing characters of this species.

Cooktown, Queensland. One specimen; in November.

TRACHYDORA ARGONEURA, n. sp.

Female, 14 mm. Head, palpi, thorax, antennæ, and abdomen dark fuscous, second joint of palpi whitish internally towards base, abdomen ringed with whitish beneath. Legs grey-whitish, middle and posterior pair fuscous above, posterior tibiæ and tarsi banded with whitish. Forewings elongate-lanceolate; dark fuscous, more or less finely irrorated with whitish; a more or less distinct thick blackish streak from costa at base to apex, broadest on anterior half; a short elongate white streak lying on upper edge of streak at three-quarters from base; two very short oblique white streaks, from costa at one-sixth and one-quarter, reaching upper edge of median streak; streaks separated by a line of ground colour; a fine black line along termen and apex, posteriorly edged by a narrow whitish line, rather obscure; cilia cinereous grey, terminal third blackish. Hindwings lanceolate, narrow; fuscous; cilia fuscous.

Melbourne, Victoria. Two specimens; in March.

Petrographical Description of some Varieties of Granite from near Olary, South Australia.

By W. G. Woolnough, B.Sc., F.G.S., Lecturer in Mineralogy and Petrology, University of Adelaide.

[Read September 8, 1904.]

The rocks which form the subject of the present note were collected by my friend and colleague, Mr. W. Howchin, F.G.S., on a recent visit to the northern parts of the State. From their stratigraphical relationships he thought they might possibly represent the equivalents of the Tapley's Hill slates in a highly metamorphosed condition. He submitted them to me, with the object of obtaining evidence for or against such a theory. I have had some of the most typical varieties sectioned, and have described four of these with some detail. The stratigraphical relationships will be described by Mr. Howchin in a separate communication to this Society.

Gneissic Granite (a) from Hills near King's Bluff, Olary District.

In hand specimen the rock appears holocrystalline in texture. The general colour effect is pinkish-grey. Its most obvious feature is the evidence of intense strain to which the rock has been subjected, and which has produced an imperfect foliation. The pressure has been relieved by shearing. The surfaces along which slipping has taken place are not planes, but are curved or irregular; a large amount of mica, both biotite and muscovite, has been developed on them, giving them quite a greasy lustre. With the naked eye and the lens there can be distinguished quartz, pink and white felspars, the latter striated, and glistening flakes of black and white mica, biotite being the more conspicuous of the two, though the largest flakes are of muscovite. These large surfaces of muscovite show a kind of "lustre mottling."

Microscopic Characters.

In section the texture is seen to be granitic, but the crushing has produced a complete shattering of many of the constituents, which makes the texture appear much finer than it must originally have been. The foliation seen macroscopically is not quite so marked under the microscope.

Quartz is abundant, and, as is generally the case, has suffered much more from dynamic forces than any of the other constituents, which, though softer, are less brittle. In ordinary light the large allotriomorphic sections of quartz appear perfectly limpid except for the comparatively few inclusions they contain. These appear to be chiefly cavities containing liquid, and a relatively rather large bubble, which, in some cases, shows spontaneous movement. In other instances the cavities contain only gas. Almost every grain of quartz ex-

hibits marked strain effects. These vary from the development of undulose extinction through peripheral shattering to complete granulation.

Felspar is abundant, and is of at least two types. Orthoclase occurs in comparatively large, completely allotriomorphic sections, which are colourless to somewhat cloudy in ordinary light. The cloudiness is some of it due to development of kaolin, but some of the secondary material cannot be referred to that mineral. The sections are mostly untwinned, but a few exhibit twinning after the Carlsbad law. The optical properties are perfectly normal, and there is little or no trace of shadowy extinction. The difference between the refractive index of this felspar and that of quartz is apparently much greater than that of the other felspar to be described.

The dynamic metamorphism of the rock has caused a little shattering of the orthoclase, but far less than in the case of quartz. In some instances grains appear to have been completely broken up, but mostly the effect is visible only around the edge. Some grains of felspar, which are partly untwinned, and then indistinguishable from orthoclase, show in their remaining portions a very fine, hazy, polysynthetic twinning; others, again, exhibit a similar structure throughout. This is extremely suggestive of an orthoclase.

Albite is present in just about the same proportion as orthoclase, and is of the same order of size, and exhibits similar strain and decomposition phenomena. Like the orthoclase, it is much less crushed than the quartz, but evidences of mechanical movements are not wanting in peripheral shattering and bending and faulting of the twin lamellæ. The refractive index is slightly lower than that of Canada balsam. Twinning after the albite law is seen in every instance, the lamellæ being narrow and extremely regular when not interfered with by mechanical deformation. Twinning after the Carlsbad law is by no means common, but is readily recognisable in a few instances. Sections perpendicular to (010) give a maximum symmetrical extinction of 9°. The extinction is sensibly the same in the two portions of a Carlsbad twin. These measurements indicate albite with a composition not far from Ab_{12} An_1.

The amount of true decomposition in the felspar is comparatively slight. Kaolinization has taken place to a certain extent, but not sufficiently to cause more than a cloudiness in transmitted light. But the alteration is not confined to kaolinization. A large amount of secondary muscovite has been produced. This is distributed in the form of small flakes throughout most of the sections of both types of fel-

spar. It is conspicuous in the felspar on account of its bright polarization colours and its higher refractive index, but is perfectly clear and colourless. Though scattered through the whole of the large grains of the enclosing mineral, it is particularly abundant, forming a selvage around their edges, especially where the fineness of the quartz mosaic indicates a point of intense compression. These features indicate very plainly its secondary origin. All the muscovite is not, however, of secondary origin. In marked contrast to these very minute flakes there are comparatively large ragged plates of the same substance fairly abundantly distributed through the section. Their optical characters call for no special remark. Like all the other constituents they have suffered in the processes of rock movement, the results being bending and fraying, and the presence of pseudo-inclusions of quartz and felspar. True inclusions are very scarce, and include only an occasional minute prism of apatite. The individual sections of biotite are all small, but their occurrence in "nests" accounts for the apparently large individuals when they are observed macroscopically. In no case is biotite intergrown with muscovite. The colour is light yellowish-brown: the pleochroism, though strong in yellow and dark brown tints, is not so powerful as is often the case with granitic biotite, the absorption never approaching extinction. Even basal sections are just noticeably pleochroic: in convergent light they give a dark cross which breaks up into hyperbolic brushes. The optic axial angle is very small. The usual decomposition into moderately pleochroic, bright green chlorite, with very weak double refraction, is observable. The only inclusions are a few small prisms, apparently zircon, but these are not surrounded by pleochroic halos. The biotite does not show strain effects.

Iron ores of various kinds appear as accessory constituents. Some of the opaque material seems to be magnetite, some is certainly ilmenite. The composition of most of it is probably that of titaniferous magnetite. Some leucoxene has been developed at the expense of these ores. A very occasional grain of pyrite is met with.

Traces of calcite occur amongst the thickest aggregates of secondary muscovite. Apatite is sparingly distributed throughout the rock.

Unfortunately, I am not in a position to have chemical analyses made, and the time and means at my disposal do not permit me to carry them out myself. As a substitute I have calculated the analysis from a quantitative determination of the mineral composition by the method of Rosiwal.*

* Cross, Iddings, Pirsson & Washington: "Quantitative Classification of Igneous Rocks," Univ. of Chicago Press, 1903, p. 204.

In this calculation certain assumptions have been made. It has been assumed that albite and orthoclase are present in equal amounts. This is very nearly correct, and a quantitative separation of the felspars would have very nearly doubled the time occupied in measurement. The variation in the amounts of $Si O_2$ and $Al_2 O_3$ from this cause is certainly negligible. The total amount of alkalis is approximately correct, too. Albite has been calculated as pure Ab, whereas it is $Ab_{12} An_1$. Some $Ca O$ is thus neglected, and the $Na_2 O$ is correspondingly high. Ideal compositions have been assumed for orthoclase and muscovite. The composition assumed for biotite is that given by Messrs. Cross, Iddings, Pirsson, and Washington, in column C, Table xiv., of their "Quantitative Classification of Igneous Rocks."* This constituent occurs in such small amount that the error involved in using the assumed composition is certainly very small.

$Na_2 O$ and $Ca O$, which occur in proportions amounting to only a fraction of a per cent., have been neglected.

Iron ores have been calculated as $Fe_3 O_4$.

The chief probable errors in the calculated analysis are therefore as follows :—

Some $Ca O$ is certainly present, but the amount is likely to be less than 1 per cent. $Na_2 O$ is proportionately high.

$Ti O_2$ is likely to be a very little low, as the $Ti O_2$ content of the ores has been neglected.

$H_2 O$ is sure to be somewhat too low—probably not much.

Traces of S, $C O_2$, and $P_2 O_5$ must occur. Analyses of two other granites are inserted for comparison. Both are taken from Dr. Washington's list of analyses :—

	I †	II.	III.
$Si O_2$	69·28	70·65	68·87
$Al_2 O_3$	16·28	16·16	16·62
$Fe_2 O_3$	1·64	1.53	0·43
$Fe O$	1·52	0·52	2·72
$Mg O$	0·70	trace	1 60
$Ca O$	not estimated	0·55	0·71
$Na_2 O$	2·90	0 54	1·80
$K_2 O$	6·54	8·66	6·48
$H_2 O$	0·97	1·22	0·74
$Ti O_2$	0·18	—	—
$P_2 O_5$	—	—	0·05
Total ...	100·01	99·83	100·02

* Loc. cit., Table xiv. Analysis C.

† N.B.—Decimals are untrustworthy in I. They have been introduced to show that there has been no clerical error in calculation.

I. Gneissic granite, hills near King's Bluff, Olary, S.A. (calculated).

II. Granite, Chywoon, Morvah, Cornwall (Teall: British Petrography, 1888, p. 314).

III. Granite, Wilson's Creek, Omeo, Victoria (Howitt: Trans. Roy. Soc. Vic., vol. xxiv., 1888, p. 122).

The calculation of the norm leads to the following result:—

	Per Cent.
Quartz	26·04
Orthoclase	38·36
Albite	24·63
Corundum	4·49
Hypersthene	2·76
Magnetite	2·32
Ilmenite	·46
Total	99·06

The rock, therefore, belongs to Class I. Persalane, Order 2 Britannare, Rang. 1 Liparose, Subrang. 3. *Liparose.*

It is certain that a chemical analysis would show that some of the soda should be replaced by lime. A lowering of the soda by ·75 per cent. would bring the rock under consideration into Subrang. 2 (Omeose), of which the granite from Wilson's Creek, Victoria (Analysis III. above) is the type.

Gneissic Granite (b) from Hills near King's Bluff.

Macroscopic Characters.—In hand specimen the rock is light pinkish-grey in colour, speckled with black, and exhibiting silvery-white patches. The texture is holocrystalline, moderately fine, and the rock is roughly foliated. On examination with a lens, pink and white felspars are seen to be abundant, but striation of the felspar is not apparent. Abundant interstitial, milky quartz is present. The black material is biotite, the silvery mineral is muscovite, the two micas being about equally abundant. The muscovite is in larger flakes than the biotite and exhibits very markedly the phenomenon of lustre mottling. Additional evidence of strain is afforded by the occurrence of rough joints and by the development on them of secondary mica, both muscovite and biotite.

Microscopic Characters.—In section the rock is hypidiomorphic granular in texture. The foliation which is so marked a feature macroscopically is just as important under the microscope. In addition to the bending the indi-

vidual minerals show the effects of strain to a considerable extent. Decomposition has progressed very slightly indeed. Quartz is abundant in perfectly clear and very much rounded sections of comparatively small size. In the last rock described quartz formed a mosaic of small grains, but in this case there is nothing that can be called a mosaic. The individual grains are comparatively widely separated and are perfectly independent optically. The mineral is sparingly dusted through with very minute inclusions, which, under the highest power available, appear to be filled, some with liquid, some with gas. The shapes of these cavities are mostly irregular, but polygonal forms (negative crystals) are by no means rare. The liquid cavities have bubbles, whose volume bears no fixed ratio to that of the liquid. Movement of the bubbles is very pronounced. In addition to these unindividualised inclusions the quartz grains contain small grains and crystals of biotite, zircon, and rutile (?), the last two very rare.

Felspar is abundant in relatively large, perfectly allotriomorphic grains, the outlines of which are often very angular and irregular. At first sight there seems to be no connection between adjacent grains, but closer inspection shows that, in a fair number of instances at any rate, two or more neighbouring granules are certainly parts of a single original crystal. All stages between slight difference of optical orientation and a complete obliteration of all trace of relationship are met with. As a rule, the mineral is nearly free from decomposition products. Where the latter are present in anything like considerable quantities they are generally thickest along the (010) and (110) cleavage planes. In many instances the felspar is so perfectly water clear that it would be difficult to distinguish it from quartz but for the twinning, or, in its absence, the refractive index. Whilst mechanically the effects of rock movement are very marked in the breaking of the grains described above, opticallv the felspar is singularly free from any sign of strain. In all cases where the section is not parallel to the plane of composition fine lamellar twinning after the albite law is beautifully developed. Carlsbad twinning is associated quite often, but in only one instance have I detected lamellæ after the pericline law. In an odd crystal here and there the lamellæ are faulted, but they are nowhere bent, nor is there any extensive undulose extinction. This combination of characters makes the optical determination of the species easy and satisfactory. Sections in the zone perpendicular to (010) give maximum symmetrical extinctions of 13°. The difference in the extinction of different parts of the Carlsbad twin is just perceptible with

a Bertrand's quartz plate, but not measurable. Sections parallel to (010) are relatively fairly numerous. They show absolutely no trace of zoning, and so appear quite like orthoclase. The cleavage parallel to (001) and the rough cracks and lines of decomposition products permit the orientation of the sections to be determined. The extinction angle is $+18°$. In convergent light the point of emergence of an acute bisectrix is seen within the field, but near the edge. The optical sign is positive. The refractive index is less than that of quartz at all contacts. The felspar is thus almost pure albite, with no perceptible intergrowth with isomorphous compounds.

Muscovite, both primary and secondary, is abundant. As a primary mineral it forms large flakes, whose optical characters are quite normal. It is intergrown in the usual way with biotite, the basal planes of the two minerals being parallel. The mineral is perfectly destitute of colour, and exhibits no characteristic microstructure. It contains, as do all the minerals of the rock, a few prisms of rutile and apatite. The secondary mica, though distributed through the section, is particularly abundant in the folia containing much primary mica, where it forms felt-like masses, with strong double refraction. It is derived in part from the primary muscovite, as the latter can be observed fraying out and breaking up. Some of it is derived from felspar, as portions of unaltered felspar can be detected amongst it.

Biotite is primary in all cases. It is of the same order of size and abundance as the primary muscovite, and, as above noted, is intergrown with it. Both minerals are somewhat frayed out at the ends, but are not much bent or broken. The biotite is light yellowish-brown in colour, and is very strongly pleochroic. When the vibrations are perpendicular to the cleavage the colour is yellow, the vibrations parallel to the cleavage being almost entirely absorbed. Around the few small prismatic inclusions (probably rutile) marked halos of dark colour are produced. Grains and imperfect crystals of magnetite, all of comparatively small size, are present, but not abundant. Small prisms of apatite are even scarcer. The most abundant accessory mineral is rutile. This is scattered through the section, and is included by all the essential constituents. In most instances the rutile builds short, thick prisms, surmounted by pyramids, but occasionally the crystal form is not apparent, and the mineral assumes the shape of round grains. No certain trace of twinning was observed. The colour is bright orange by reflected light, reddish-brown by transmitted light, though the smallest individuals appear somewhat greenish. The refractive index is so high that many of the more round-

ed pieces appear almost opaque. Between crossed nicols only the smallest individuals show bright polarisation colours, on account of the exceedingly strong double refraction.

Gneissic Aplite, near base of Granite Range, West of King's Bluff.

Macroscopic Characters.—The rock is granitic in texture, and rather coarse in grain. The mass colour is yellow, but it is speckled with small grains of a black material, the arrangement of which points to a fairly marked foliation. Under the lens it is seen to consist almost entirely of felspar, quartz, and magnetite. Felspar is the most abundant constituent. It occurs in pinkish-yellow (tabular) sections up to about 8 mm. in diameter, striking on account of the perfection of the cleavage. On cleavages parallel to the base (001) twinning after the albite law can be noticed, combined occasionally with that after the Carlsbad law. Quartz is present in translucent grains of small size, but is fairly abundant. No mica or other ferromagnesian mineral is to be detected. The abundance of magnetite in so acid a rock is remarkable. The grains are up to about 1 mm. in diameter, and, as already noted, are arranged in roughly parallel lines. The rock is obscurely jointed, and a little secondary muscovite has been developed on the joint surfaces.

Microscopic Characters.—In thin section the rock possesses several features in very marked contrast to those previously described. In the first place, the absence of primary mica of any kind is very striking. Then the evidences of strain in the felspar are much more marked here. The abundance of magnetite in so acid a rock is also somewhat remarkable.

The essential minerals present are quartz, albite, and magnetite, the texture being hypidiomorphic granular.

Albite occurs in relatively large, perfectly allotriomorphic sections. These are, on the whole, perfectly clear and colourless, though they contain a considerable amount of dusty decomposition product. Examination of the optical properties indicates practically pure albite, the measurements being practically identical in all cases with those given for the other rocks described and as thoroughly satisfactory. The difference of extraction angle between the two portions of a Carlsbad twin rises here to about 3°. Lamellæ after the pericline law are quite frequent *and in all cases are certainly of secondary origin.* They appear in sections which have obviously been subjected to crushing, and in many instances there is a very obvious faulting along their plane of composition. The faulted portions, which have a step-like arrangement, contain pericline lamellæ, but no albite lamellæ, whilst in the

unfaulted parts the converse is the case. The plane of composition is thus a gliding plane. It has also acted as a solution plane, for the boundaries of the lamellæ are often marked by strings of irregular liquid and gaseous inclusions. In a section parallel to (010) the angle of inclination of these lamellæ to the trace of the (001) cleavage is slightly variable between the limits +23° and +26° These angles are greater than those for pure albite,* but as everything is so sharply defined I feel confidence in my measurements.

Additional evidence of strain is afforded by the condition of the albite lamellæ. These are in many instances bent and faulted. Where the latter effect has been produced the *albite lamellæ are suppressed for a short distance on either side of the fault line.* Another striking feature is observed in the neighbourhood of certain quartz grains. The lamellæ immediately surrounding the granules are suppressed, whilst those further out are curved so as to very strikingly resemble the "knots" in a piece of pine. The resemblance is still further apparent where the quartz grain does not appear in the thickness of the section, and only the bending of the lamellæ is apparent. These observations seem to suggest that in these rocks at all events *twinning after the albite law is of primary origin, but that molecular shifting may be produced by pressure, the result being an obliteration of the twinning. On the other hand, twinning after the pericline law is of secondary origin, and is accompanied by the development of gliding planes parallel to the plane of composition of the twinning.*

These results are interesting, and, if borne out by further investigation, may be of considerable importance. I do not by any means wish to announce them as a general law; the statement applies simply to the rock under examination.

Quartz is fairly abundant, and is under two fairly distinct habits: i., small, round sections, included fairly centrally in the albite; ii., larger and more irregular grains, which are interstitial in character, or else are included in the peripheral portions of the felspar sections.

The sections under the first category are, a few of them, certainly idiomorphic, the habit being that often found in quartz porphyries, viz., with almost entire suppression of the prism. Most of the sections are, however, nearly circular or only subangular. Those most centrally situated in the felspar exhibit no trace of optical continuity, but towards the

* Rosenbusch-Iddings: "Microscopical Physiography of the Rock-making Minerals," 4th edition, p. 329.

outer boundary of the host this property is strongly developed. All contain liquid inclusions with moving bubbles, but I think the individuals nearer the centre of the felspar contain fewer than those closer to the periphery or than the interstitial quartz. The latter occurs in relatively somewhat larger grains. It is perfectly angular, and shows the effects of strain in its shadowy extinction, incipient, and even advanced fracture. Much of it shows pegmatitic intergrowth with the albite.

Magnetite, as already stated, is remarkably abundant for so acid a rock. It occurs in idiomorphic subidiomorphic and irregular grains scattered through both the other minerals. It has not undergone much decomposition, but has nevertheless given rise to some staining of the rock with red and yellow oxides of iron. An interesting feature is that in the majority of instances the grains of magnetite are surrounded by a partial or complete halo of muscovite, giving bright polarisation tints.

Muscovite is very scarce in the rock. No large sections at all occur, but it all assumes the form of fine flakes around the magnetite grains, or grouped in aggregates with the general characteristics of what has been called in the other rocks described secondary muscovite. That some, perhaps all, of it may really be primary is rendered possible by the fact that some of the magnetite grains provided with halos are completely surrounded by quartz, and it is difficult to see how muscovite could be formed secondarily in such a position.

Gneissic Granite, Outcrop behind Olary.

Macroscopic Characters.—The rock is yellowish-pink in colour, holocrystalline, but somewhat fine in grain. It is markedly foliated in hand specimen. Under the lens it is found to consist of quartz, felspar, and chlorite.

Quartz is abundant in small, rounded grains, and is clear to milky. The felspar sections are mostly small, but here and there a comparatively large section is met with in the form of an "eye," though typical "*augen*" structure is not well developed. The mineral is flesh-coloured, and shows Carlsbad and albite twinning where the sections are large enough to show structures distinctly. Only a small amount of muscovite is developed, and this is in small pieces. Biotite is much more plentiful, and occurs in streaks, giving the rock the foliated appearance. The piece of rock under examination contains several foreign fragments. One of these is a small piece of sericite schist about 25 mm. x 10 mm. x 3 mm. All the others are fragments of vein quartz.

Microscopic Characters.—The rock is essentially a medium grained hypidiomorphic granular mixture of quartz and albite, with a considerable quantity of chloritic substance derived from limotite and ilmenite. All the minerals show strong evidence of crushing, which has probably materially modified the original character of the rock. Foliation obvious in hand specimen is not distinct under the microscope. The quartz and felspar call for very little description, as they present features similar to those in the three last rocks described. In this instance, however, there is more interstitial quartz and less included in the felspar, which is in much smaller pieces. Both minerals are much shattered, and give markedly undulose extinctions. In the felspar twinning after the albite law is moderately developed, but is very often hazy, perhaps owing to strain. Certainly the lamellæ are often bent and broken.

The chloritic material is dirty green in colour and is of markedly micaceous habit, the plates often being arranged in rosettes, which give a black cross between crossed nicols. The pleochroism is marked: light yellow when the vibrations are perpendicular to the cleavage, greenish when they are parallel to it. Double refraction is very weak, the colours being the characteristic azure tints of chlorite. Sections parallel to the cleavage are sensibly isotropic. The figure in convergent light is exceedingly hazy, but appears to indicate a biaxial mineral. At the edges of each flake the colour changes to bright orange-yellow, indicating a more ferriferous variety, and there is a corresponding increase in double refraction, the colours at the edge being of the same order as those of quartz. The original biotite must have been strongly titaniferous, as the chlorite which has been produced by its alteration is much mixed with granules, of greyish sphene, even where no ilmenite can be detected.

Ilmenite is moderately plentiful in rather irregular grains, which in some cases appear to be aggregates of minute granules. A certain amount of decomposition into leucoxene is noticeable.

Rutile in small, stumpy pyramids and rounded forms is scattered through all the minerals indiscriminately; in the chlorite they give rise to dark pleochroic halos. The smaller individuals are practically opaque, the larger ones show a dark reddish-orange colour by transmitted light. A few zircons, some of them of relatively very large size, are present, and are distinguished from rutile by their lack of colour and weaker double refraction.

Summary.

The rocks from all the localities studied agree in certain well-defined properties:—

i. They are certainly igneous in origin, and do not represent highly metamorphosed sediments.

ii. The triclinic felspar is of remarkably uniform composition throughout.

iii. All show evidence of intense earth movements at some period of their history.

iv. They are on the whole rather highly titaniferous.

The evidences of movement are somewhat variable and are rather difficult to interpret as a whole. Pure albite is characteristic, not of eruptive, but of metamorphic, rocks. It is to be noted that in the rock which shows the least advanced degree of crushing, namely, the first described, the triclinic felspar contains some An. In the remaining rocks it appears to be pure Ab. This seems to indicate a certain amount of molecular reconstruction.

In some of the rocks cataclastic structures are common, but in others, particularly the most thoroughly foliated ones, shattering is not noticeable. In the latter case it would appear that the rock was plastic at the time the reconstruction took place; that is, that it was at a sufficient depth below the surface to come into what Van Hise* has termed the zone of flowage.

It is probable that the first rock described represents the least altered facies.

The conclusion arrived at on page 189 with regard to the twinning of the albite is of interest if it is substantiated by other investigations.

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* Van. Hise: "Some Principles Controlling Deposition of Ores." Trans. Ann. Inst. Mining Engineers, vol. xxx., 1900, p. 31.

Petrographical Notes on some South Australian Quartzites, Sandstones, and Related Rocks.

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[Read October 4, 1904.]

Plates XXXIII. and XXXIV.

When this paper was undertaken it was intended that it should be the first of a series dealing with the petrography of South Australia. As South Australia is remarkable for the comparative scarcity of its eruptive rocks, I began with those of sedimentary origin. I examined the arenaceous rocks first, as being of simplest mineral composition, and therefore most likely to retain their original characters in regions where metamorphic forces have been active. My removal from the State renders it impossible for me to complete the scheme outlined above, and I bring forward these isolated observations in the hope that they may stimulate some other observer to carry out what promises to be an extremely interesting and very valuable piece of research.

A detailed and systematic investigation of the microscopical petrography of the sedimentary rocks of South Australia is rendered absolutely necessary for the purpose of stratigraphical correlation, by the paucity of fossils in the Paleozoic, and probable absence of them from the pre-Cambrian, rocks.

Quartzites and sandstones from upwards of fifty different localities have been examined, and thirty-eight of the types are briefly described in the following pages. More attention has been paid to the microscopic than to the macroscopic characters.

One of the most important horizons of arenaceous rocks is the immensely thick series of quartzites, sandstones, and phyllitic slates which underlies the Cambrian glacial bed in the type district of the Sturt River, and which forms the whole of the western portion of the Mount Lofty Ranges in the immediate neighbourhood of Adelaide. There are probably several bands of quartzite in this series with almost identical lithological features. In absence of a very detailed outcrop map of this intensely folded and faulted region it is impossible to correlate the various outcrops at present.

Specimens from different parts of the district differ very considerably in texture and general appearance, but all agree in certain well-defined characteristics.

i. Mitcham.

Macroscopic characters.—Very coarse grained and intensely hard rock, composed of rounded and angular grains of different materials firmly cemented together. Fractures across and not around individual grains, fractured surface being very vitreous. Chiefly colourless quartz, together with a little which is smoky and still less opalescent. A good deal of fresh-looking, pinkish felspar and still more that is strongly kaolinized. Considerable number of rock fragments, mainly liver-coloured cherty rock and greenish schist.

Microscopic characters.—Texture very coarse. About 40 per cent. felspar, rest mainly quartz. Quartz in completely angular grains in optical contact. All show evidence of having been originally rounded grains. The present form is due to secondary deposition of quartz upon the clastic grains in *optical continuity* with the original (rejuvenescence of crystals). Inclusions not very abundant. Mostly liquid and gas cavities, the former with moving bubbles. These are mostly irregularly distributed through the quartz, but long lines of inclusions evidently occupying secondary solution planes pass without interruption through two or more contiguous grains. This indicates that the rock has been buried to a very considerable depth below the earth's surface. A few individualised inclusions consisting of small mica plates and zircon (?) crystals are also present. Not much evidence of severe strain. A little undulose extinction has been induced, but only very rarely has a quartz grain been completely shattered.

Felspars are of three distinct types:—*a*, Albite, in clear and undecomposed idiomorphic sections; *b*, microcline, fresh and somewhat idiomorphic; *c*, orthoclase, also fairly idiomorphic, but very much kaolinized. One very remarkable feature about the microcline is the very noticeable development of secondary felspar in optical continuity with the material of the originally rounded grains. Sometimes the rim shows no trace of twinning, but in other cases the twin lamellæ of the original grain are continued without interruption in the rim.

Composite grains more numerous than they appear to be macroscopically. Many of them are evidently composed of reef quartz, others of a finely granular aggregate of quartz and microcline (probably gneissic), others of an excessively fine-grained, cloudy, quartzose rock (chert), and a few of fine-grained micaceous schist.

A little barytes is present in small radial aggregates, but, considering the comparative abundance of this mineral in

veins and cavities in the Mitcham rocks, very little of it has been observed under the microscope.

Plate xxxiii., fig. 1, gives a general idea of the structure of this rock.

ii. Mitcham.

Macroscopic characters.—Very much finer in texture than i. This is probably due to its consisting of finer sediment originally, but the fineness of grain is also partly a secondary effect. Fracture and lustre as in i. Exactly similar mineral composition.

Microscopic characters.—Texture moderately fine. Nearly all grains very angular, a few rounded or ovoid. Largest grains are round ones of felspar, quartz grains smaller and more angular. Mineral constituents in about the same proportions as in i.

Quartz much shattered, almost every fragment showing undulose extinction. Inclusions not abundant, and without regular arrangement. Felspars of same types and general characters as in i., but showing very distinct evidence of strain in bending of twin lamellæ and development of undulose extinction. A good deal of sericitic mica is developed around the periphery and occasionally in the mass of the felspars.

A few moderately large flakes of muscovite are present, but most of the mica has a sericitic habit, and is evidently secondary in origin. In addition to the direct association of sericite with felspar a good deal is present as an interstitial cement.

Finely granular dolomite also is abundant as a cement, and a few grains of pyrites, biotite, and tourmaline are included. Composite grains as in i. This rock differs from i. only in its finer texture, which is evidently chiefly the result of pressure, and in the presence of secondary sericitic and dolomitic cement.

iii. Dunstan's Quarry, Stonyfell.

Macroscopic characters.—Exactly like ii.

Microscopic characters.—Intermediate between i. and ii. Texture moderately fine, and evidently the result of cataclastic processes. All grains show traces of rounding. Felspars less idiomorphic than in preceding types. Quartz much shattered, but still preserves traces of rejuvenescence of originally rounded grains. Sericite associated with felspar grains and distributed through slide as in ii. The amount of dolomite varies considerably in adjacent parts of the rock. In some sections it is entirely absent.

Rutile needles, pyrites, and tourmaline grains are present, the last being bluish in colour. Some of the felspar grains contain small crystals of apatite.

iv. Lower bed, Waterfall Gully; forming lip of fall.

Macroscopic characters.—Medium grained, very vitreous, pinkish quartzite, with a good deal of hæmatite staining. Felspar fragments as in the preceding rocks. Fractures across the grains.

Microscopic characters.—Moderately coarse in grain, though not so coarse as i. Mineral composition like i., but relatively less felspar. Felspar shows little trace of idiomorphism. Quartz exhibits much strain structure, often amounting to complete peripheral granulation. Secondary overgrowth of rounded quartz grains very marked. Planes of inclusions (gas and liquid) cut through adjacent grains. Some of the quartz grains contain excessively fine rutile (?) needles.

Composite fragments as in the preceding rocks. There is little sericitic material except in direct association with felspar grains. The sericitic areas, cleavage cracks in the felspars, and similar absorbent portions of the slide are strongly stained by iron oxides, and the pyrites of the preceding rocks is here represented by hæmatite pseudomorphs.

v. Waterfall Gully.

Very massive bed, at upper fall.

Macroscopic characters.—Rather fine-grained, intensely hard, vitreous quartzite, very much jointed, fracture conchoidal.

Microscopic characters.—Quartz much the same as in iv., but much less felspar, sericite very much more abundant. Cherty fragments rather abundant, and amongst other composite grains those composed of quartz and microcline are important.

In parts the rock consists essentially of a mass of angular and subangular quartz grains, set in fine sericitic ground mass. Strain structures in the quartz amount to complete shattering, but do not approach thorough granulation. Rejuvenescence of quartz grains marked.

vi. Gumeracha (exact locality not known).

Macroscopic characters.—Strongly pyritic, grey quartzite, very vitreous on fracture. Felspathic constituents not so prominent as in the rocks near Adelaide, as they are more colourless.

Microscopic characters.—Texture medium. About 30 per cent. felspar, rest chiefly quartz. There is a good deal of authigenic pyrites. Very subordinate amounts of biotite. Composite grains not recognisable with certainty on account of the intense crush.

The structure of this rock affords a beautiful illustration of the effect of crush. Every grain shows evidence of pressure in the development of undulose extinction, incipient fracture, or complete granulation. In spite of the abundance of felspar, however, there is no sericite developed. The quartz grains are *dovetailed*, and not cemented together In fact, there is practically no recrystallization of material, and this suggests that water was absent during the period of pressure. The production of cross-hatched twinning in a felspar as the result of pressure is illustrated in one section. The whole rock has a distinctly foliated appearance. The lines of inclusions in the quartz granules do not pass from grain to grain.

vii. Gumeracha (exact locality not known).

Macroscopic characters.—Rather coarse framed, very distinctly schistose quartzite, of pinkish colour. Fractures around the grains as well as across them. Parallel folia differ in texture and are differently silicified. No felspar noticeable.

Microscopic characters.—Coarser bands are probably due to entire recrystallization of the quartz. Strain structures comparatively slight, though there is a good deal of undulose extinction and peripheral granulation. A few rounded flakes of biotite are included, and lines of liquid and gas cavities are continuous from grain to grain. These lines appear to be perpendicular to the plane of schistosity of the rock, and therefore parallel to the direction of maximum pressure. The finer bands of the rock consist of completely angular quartz grains, whose arrangement gives a very marked foliated appearance to the rock, but which show remarkably little evidence of strain. These bands are crowded with small muscovite and biotite flakes, rutile crystals (some of which show geniculate twinning), and zircon crystals. The arrangement of all of these, with their long axes in one direction, makes the schistose appearance of the rock all the more striking. Some little patches of sericitic material are also present, but no felspar or composite grains can be observed. The rock, as a whole, is very porous.

viii. Mount Pleasant.

Macroscopic characters.—Very like those of vi.

Microscopic characters.—The same type of rock as vi., but finer in texture and more felspathic. About 40 per cent. of the rock consists of felspar, the rest is mainly quartz, a little biotite is present.

There is evidence of very severe crush, which has resulted in very extensive shattering of the quartz grains, with very

little development of undulose extinction or production of sericite. Quartz grains are dovetailed. Felspars are mostly microcline and orthoclase, the latter kaolinized. Composite grains are present, but are difficult to distinguish from granulated quartz fragments.

ix. Mount Pleasant.

Very similar to vii. Difference of grain in different bands is not so great. Much less mica is present, its place being taken by light-coloured interstitial chlorite.

x. Spring Creek, Mount Remarkable.

Macroscopic characters.—Distinctly banded rock, consisting of layers differing in composition and texture. Finer grained layers are dark greenish-grey in colour, and are composed chiefly of quartz, with a few felspar and rock fragments of a pinkish colour. Coarser grained layers are more pink because of the greater abundance in them of the coloured constituents above noted. Fracture rather round than across the grains, except in the finer bands.

Microscopic characters.—Consist of rather coarse, perfectly rounded grains, set in a finer ground mass of the same materials. Mineralogically similar to the type rock of Mitcham (i.), but differs in the very much greater relative abundance and variety of the composite grains. These make up quite 30 per cent. of the rock. Remainder of the rock is composed of quartz and felspar in about equal abundance. The felspars are similar to those in the Mitcham rock (i.), but are all rather decomposed; some contain a little chlorite along the cleavage cracks. No strain structures are noticeable in either quartz or felspar.

The most abundant or remarkable types represented among the composite grains are as follows:—

1. Rounded grains of reef quartz. 2. Rounded grains of quartz rock, whose high degree of internal granulation indicates that they were derived from crystalline schists. 3. Particles of very fine grained, nearly opaque, micaceous slate. 4. Fragments of decomposed holocrystalline, but rather fine-grained, eruptive rock, composed of kaolinized felspar, quartz, chlorite, and apatite. 5. A few pieces of granophyre, consisting of a mass of minute spherulitic aggregates of quartz and felspar.* A considerable amount of interstitial viridite is present and acts as a cement.

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* A rock very similar to this occurs as a large erratic in the Upper Cretaceous series, near Stuart's Creek.

xi. West of Woodside (stone reserve, Section 221, Hundred of Onkaparinga).

Macroscopic characters.—Fine-grained, white quartzite, highly felspathic, breaks across the grains, much jointed.

Microscopic characters.—Very fine in texture, much crushed, and perfectly cemented. All the constituents in extremely angular grains. No recognisable composite grains, otherwise the rock is mineralogically very similar to the type rock of Mitcham, but felspars of all types are rather more abundant. There is a little clastic mica, but none that is certainly secondary. A small amount of interstitial chlorite is present.

xii. Anna Creek Railway Station. (Loose fragment on the surface. Quartzite hills occur immediately to the east.)

Macroscopic characters.—Very fine-grained grey felspathic quartzite, with vitreous lustre on fracture.

Microscopic characters.—Rather fine-grained mosaic of quartz and felspar. The latter mineral is not so abundant as in the Mitcham rock. All the original grains were completely rounded, but secondary outgrowth, affecting both quartz and felspar, has converted the rock into a perfect mosaic. None of the grains show the slightest evidence of strain. The felspars are mostly orthoclase, with only a little microcline and albite. The secondary rim, in the case of the felspar grains, is more kaolinized than the original material. A little tourmaline and pyrite is present. The mineral composition of this rock, obtained over five hundred miles north of Adelaide, is strikingly similar to that of the rock from Mitcham.

xiii. Baroota Creek, Flinders Ranges. Under the glacial bed.

Macroscopic characters.—Medium grained, greyish-white quartzite, with white felspathic particles.

Microscopic characters.—Identical in mineral composition with the rocks of Mitcham and Burnside, but different in texture. The rock consists of a number of quartz and felspar grains, and a good many composite particles set in a "mortar" of fine-grained, angular material of the same character, together with abundance of dolomite in sharp crystals, or allotriomorphic aggregates. It is possible that the fine-grained base of this rock is due to the shattering of larger particles through crush. Nearly all the quartz shows evidence of strain, but felspar crystals are present whose shape suggests that they have not been subjected to much pressure.

xiv. Maitland, Yorke's Peninsula. No. 1 bore.

Macroscopic characters.—Hard, brownish-pink quartzite, very vitreous on fracture. Abundance of clear to cloudy pinkish felspar present, and some rock particles. Some of the quartz is milky to opalescent, but most is clear.

Microscopic characters.—Very similar to those of the Mitcham and Burnside rocks. Texture coarse. Quartz is most abundant mineral, but felspar is plentiful. A good many schist fragments are present. The chief feature about the rock is the extraordinary perfection of the secondary outgrowth of the quartz grains. All the quartz grains must originally have been perfectly rounded. Secondary addition of quartz in optical continuity has produced a perfect mosaic. The original surfaces of the grains are indicated by lines of dusty inclusions. (Plate xxxiii., figs. 2 and 3.) The secondary silica is all quartz, no chalcedony having been produced.

xv. Two miles west of Ardrossan, Yorke's Peninsula. This rock outcrops on Mr. Dinham's farm, near the road to Maitland. It lies directly upon the upturned edges of pre-Cambrian schist and gneiss and is overlain, apparently unconformably, by very fine-grained vitreous quartzite and the strongly chalcedonized *Turritella aldingæ* bed of the Eocene.

Macroscopic characters.—Very variable in hardness, some of it being almost unconsolidated sand, while in the same hand specimen are portions with the characters of an intensely hard quartzite. The material is almost entirely quartzose; a little chalcedony is present in the consolidated portions.

Microscopic characters.—On casual examination the large amount of milky white material in the rock suggests an important felspar content, but optical investigation shows that all this material is quartz, rendered almost opaque by the enormous number of minute, irregular gas cavities it contains. An appearance simulating cleavage is due to the arrangement of inclusions along well-defined parallel planes. No composite particles were observed. The secondary outgrowth of the originally rounded quartz fragments is very remarkable. In some parts of the rock adjacent secondary rims have met and mutually interfered, and a mosaic is produced. In other portions the rejuvenescence has reproduced ideally perfect quartz crystals with their free ends pointing into a cavity now completely filled with chalcedony. A little rutile is present in sharp crystals, and some hair-like prisms which may be rutile. There is a little muscovite and zircon and some dark brown tourmaline in grains and prisms. (Plate xxxiii., fig. 4.)

xvi. Two miles south of Ardrossan. A quarter of a mile north-east of Miss Norton's house.

Macroscopic characters.—Rather coarse, greyish grit, with a notable amount of pinkish and whitish felspar. Fractures around and not across the grains.

Microscopic characters.—Texture is medium. Quartz is predominant, but felspar and chert fragments are notable in amount. Quartz is in angular fragments, almost all of which show strain structures. Slight trace of rejuvenescence of grains, and in at least one instance a reconstructed granule has been subsequently broken (possibly owing to a second period of erosion and transport). The felspar is nearly all albite, there is very little orthoclase, and no microcline, the chert particles are reddish and nearly opaque. There is a good deal of yellowish opaque material, the decomposition product of rutile, and a few flakes of clastic mica. Cement is quite plentiful, and is mainly chalcedonic, though some calcite is also present. The latter may be allogenic material (derived from the Cambrian limestones upon which the rock appears to rest).

xvii. One and a half miles south of Ardrossan. Half a mile west of Parara. This rock occurs only about a quarter of a mile north of xvi., but, both in the field and under the microscope, it appears quite distinct from it. Traced in a northerly direction its texture varies from an incoherent sand to an intensely hard and tough quartzite.

Microscopic characters.—Moderately coarse, sub-angular grains of quartz, set in a fine-grained mosaic of the same mineral. All the grains are in optical contact. Many of them show traces of rejuvenescence, some of them to a high degree of perfection. Some brown tourmaline is present in small fragments.

The stratigraphy of these three quartz rocks from Ardrossan is very complicated, and needs further investigation for its elucidation.

xviii. Plain east of Mount Remarkable.

Macroscopic characters.—Very hard rock of medium texture, composed mainly of colourless quartz, with a little whitish material. Very vitreous on fracture.

Microscopic characters.—Rock consists of medium-sized, rounded grains, set in very fine textured interstitial cement. The latter makes up about 25 per cent. of the whole rock. About 95 per cent. of the larger grains are clear quartz, the remainder are ferruginous mica slate, generally excessively fine-grained. There is no felspar in the section. Rounding of grains is generally quite complete. In

certain bands ground mass is absent and the quartz fragments are cemented by secondary outgrowth of the original grains. The rock has undergone very considerable pressure. Where there is no fine-grained cement undulose extinction is very strongly developed, but where there is a cement between the grains this phenomenon is not observed. Throughout the whole rock a very marked parallel structure has been de-developed. This is expressed by a series of parallel planes crowded with minute liquid and gas cavities. These planes are interrupted where they pass from a grain into the base, but re-appear in the same direction in the next original grain. The liquid cavities contain minute bubbles, but in no instance could I detect spontaneous movement. (Plate xxxiii., fig. 5).

xix. Mount Lofty. Quarry in the northern peak of Mount Lofty.

Macroscopic characters.—An intensely white, moderately coarse-grained rock with granular fracture. No constituents other than quartz can be made out. Its general appearance is very well described by its local name of "Sugar-loaf Rock."

Macroscopic characters.—Texture medium, structure distinctly foliated. Consists essentially of quartz and muscovite, the latter chiefly of the sericitic variety. A notable feature is the entire absence of felspar of any kind. Crushing has been very intense, so that the original quartz grains have been completely shattered. All the particles in the rock are extremely angular and show shadowy extinction. In some instances the quartz granules are in optical contact, but generally are separated by at least a film of sericite. In the interstices between the quartz grains there are considerable areas occupied by a very fine-grained aggregate of sericite and some quartz. A comparatively few large flakes of muscovite also occur. The rock may originally have contained some felspar, which was subsequently sericitized; this is improbable, as there is no trace whatever of original felspar.

xx. Upper Sturt.

Macroscopic characters.—Fine saccharoidal quartzite, somewhat finer in grain than xix. and slightly pinkish in parts. A little muscovite is visible. Fracture is conchoidal and lustre vitreous.

Microscopic characters.—Texture medium, but somewhat variable, structure markedly schistose. Practically a pure quartz rock. The grains are extremely angular, and show the effects of intense crush in optical anomaly and complete shattering. Some of the particles show evi-

dence of having undergone rejuvenescence *before* the shattering took place. The individual grains have crenulated margins and are completely interlocked. Numerous small, perfectly round grains of zircon are present.

xxi. Sellick's Hill.

Macroscopic characters.—Exactly similar to those of xx., though the colour is somewhat more pinkish.

Microscopic characters.—Very similar to those of xx. In addition to quartz, the rock contains very small amounts of muscovite, biotite, apatite, zircon, and tourmaline, and is somewhat iron-stained. Evidence of crush is slightly less marked. Lines of inclusions pass continuously through adjacent grains. Dovetailing of grains, etc., as in xx. Secondary quartz veins pass through the rock; their injection must have been prior to the later part of the period of crushing (Plate xxxiii., fig. 6). Strong tendency to cleavage in the rock. The similarity between this rock and the preceding one is remarkable, as they come from two entirely different geological horizons. Upper Sturt is in the lowest portion of the Mount Lofty series, while Sellick's Hill is in the purple slate formation, the topmost formation in the series.

xxii. Tanunda.

The geological horizon of this rock has not been satisfactorily determined. The quartzite is associated with a very extensive series of tremolite-, actinolite-, andalusite-, and mica-schists, crystalline limestones, and coarse gneisses.

Macroscopic characters.—Intensely white, saccharoidal quartzite, of rather coarse grain, with bands of still coarser, clearer material. Fracture around the grains in finer, across the grains in the coarser, portion.

Microscopic characters.—Coarse-textured aggregate of quartz, with every evidence of intense strain. Grains completely shattered. Abundant liquid and gas cavities, the former with *slow-moving* bubbles. Strong tendency for the cavities to be arranged in lines continuous through adjacent grains. A few rounded flakes of biotite occur in the quartz and in some fragments numerous excessively fine rutile (?) needles.

xxiii. Mount Barker, northern end of the mount.

Macroscopic characters.—Medium-grained, hard white quartzite, very tough, and breaks with a conchoidal fracture. Slightly micaceous.

Microscopic characters.—Texture medium. Essentially an aggregate of very irregular quartz granules, with 2-3 per cent. muscovite in large flakes, some pyrite,

and a good deal of earthy hæmatite. No groundmass and no felspar or sericite. Structure roughly foliated. There has been a very considerable amount of crush, resulting in development of undulose extinction and granulation of quartz. In addition to liquid and gas cavities, the quartz contains numerous round flakes of biotite and muscovite, and small crystals of magnetite. Large flakes of muscovite, often bent and broken, are scattered through the rock, with a general parallel arrangement. Pyrite in fresh-looking cubes. A little rutile and zircon present in crystals and fragments.

xxiv. Mount Barker, outcrop about 300 yards west of the scarp of the mount.

Macroscopic characters.—Rather thin bedded rock, somewhat coarser than xxiii., and not so hard or vitreous. More yellowish in colour.

Microscopic characters.—Texture coarse. An aggregate of irregular quartz grains in optical contact, with no interstitial cement at all. Quartz is clear and glassy, and singularly free from liquid and gas cavities, except such as lie along secondary solution planes. On the other hand, little round flakes of biotite are extremely numerous. These are exactly like those so characteristic of gneisses, and indicate that the material was derived from a gneiss, and not from a granite. A very occasional grain of orthoclase is present, but no other felspar.

xxv. Blakiston, two miles west of Mount Barker.

Macroscopic characters.—Thin bedded schistose quartzite, whitish-grey in colour, moderately fine grain, fractures across the grains, somewhat micaceous.

Microscopic characters.—Very similar to xxiii., but very much more schistose. Biotite enclosures in quartz like those in xxiv., together with some andalusite. Parallel lines of inclusions (liquid and gas) run indifferently through all the grains. A fair amount of broken and bent muscovite flakes and brown-green grains and fragments and prisms of tourmaline are present.

xxvi. King's Bluff, Olary.

Macroscopic characters.—Very white, hard quartzite of fine grain. Contains no recognisable constituents other than quartz. Fractures across the grains.

Microscopic characters.—In all respects similar to xxiii., except that texture is more uneven. Largeish quartz fragments are set in a finer-grained mass of the same material. A fair amount of muscovite is present. Structure very markedly schistose.

xxvii. Waterfall Gully, about one mile from Burnside.

Macroscopic characters.—Greenish-grey rock, composed of fairly coarse, clear quartz grains, set in a finer-grained groundmass of the same substance, mixed with dark-greenish chlorite material.

Microscopic characters.—Moderately fine in general texture. Grains are subangular to rounded, and there is a moderate amount of interstitial cement. The chief constituents are quartz and felspars of the same types as those in the Mitcham rocks. They mostly show evidence of strain, and the felspars are rather decomposed. Some of the quartz shows abundant mica flakes as inclusions. There is a little magnetite in crystals, and some tourmaline and rutile. In addition to these constituents there are locally numerous minute rhombic sections of a mineral with moderate refractive index and strong double refraction. These are pleochroic, from blue to colourless. These characters and the measured angles of the sections suggest lazulite. This is the only rock in which I have been able to detect any mineral resembling lazulite, although Rosenbusch* states that this mineral is particularly characteristic of quartzites. The cementing material is mostly a dark green, almost isotropic delessite, though there is also a good deal of kaolin stained with iron oxides. (Plate xxxiv., fig. 1.)

xxviii. Clarendon Tunnel.

Macroscopic characters.—Greenish rock of moderately coarse texture, composed mainly of quartz, with some felspar, set in dark-green chloritic base. Much pyrite.

Microscopic characters.—Texture medium. Chief constituents are quartz, felspars, composite grains. The quartz contains numerous gas and liquid cavities, and inclusions of apatite, actinolite, rutile, and zircon. Composite grains are mostly rather coarse mica schist. Interstitial material is mostly dark-green delessite, with a little sericite. Much pyrite and a little tourmaline and apatite are present, and also patches of opacite.

xxix. Coromandel Valley, near Blackwood.

Macroscopic characters.—Fine-grained, white, hard quartzite, with numerous whitish patches.

Microscopic characters.—Rather fine in texture, composed mainly of quartz, with a little felspar, fragments of biotite schist, a good deal of sericite, and only a little chloritic material. Some of the quartz grains are crowded with radiating bundles of tremolite. The most striking feature of the section is the abundance and variety

* Rosenbusch: "Mikroskopische Physiographie," ed. 3rd, p. 500.

of tourmaline, which varies from black and opaque, through various shades of brown, green, and blue. A good deal of opaque leucoxene (?) is present and some zircon.

xxx. Field River, near the mouth.

Macroscopic characters.—A moderately fine, pinkish groundmass, in which quartz and felspar can be recognised, through which are scattered numerous larger fragments, up to a quarter of an inch diameter, of quartz, pink and brown felspar, and red jasper.

Microscopic characters.—Texture fairly fine. Grains are very angular, both large and small ones. Felspar is almost as abundant as quartz, and of the felspars microcline is much the most common. Quartz fragments almost all exhibit strain. The cementing material is almost exclusively calcitic, and shows a very strong tendency towards fibrous structure. A little sericitic material is also present and very little chlorite and leucoxene. (Plate xxxiv., fig. 2.)

xxxi. Field River, small overfold, near Hallett's Cove.

Macroscopic characters.—Rather finer in grain than xxx., with no strikingly large fragments. Colour more greyish than pink. Intensely hard and tough.

Microscopic characters.—Almost exactly similar to those of xxx. The cementing material here is more dolomitic, with a very strong tendency to idiomorphism. In many instances the carbonate forms spherical radial aggregates, with or without a quartz grain as a nucleus. There is a fair amount of magnetite and some rutile.

xxxii. Wilson, on the western slopes of the Black Jack Range.

Quite a number of bands of quartzite occur in this locality, interbedded with purple slates.

Macroscopic characters.—Very white, hard quartzites of fine grain, in which no mineral other than quartz can be recognised. Fracture is granular.

Microscopic characters.—*Fine-grained rock,* essentially a mosaic of quartz. The grains are mostly clear, except around the edges of originally rounded grains, where a line of dusty inclusions occurs. Strain structures are only slight. A very small amount of orthoclase occurs in rounded grains. A feature of the rock is the comparative abundance of zircon, in crystals and grains, which, though somewhat abraded, have suffered very little during transport.

xxxiii. W i l s o n, range three miles west of town.

M a c r o s c o p i c c h a r a c t e r s.—Rather coarser in grain than xxxii. Very white and intensely hard. Silicification has been so complete that the rock appears almost homogeneous. Fracture is conchoidal, and lustre highly vitreous.

M i c r o s c o p i c c h a r a c t e r s.—Essentially a medium-textured mass of interlocking quartz grains. Very angular, and show evidence of intense strain. The rock is in all respects like that from Sellick's Hill (xxi., p. 203), and occupies an exactly similar stratigraphical position.

xxxiv. M e t r o p o l i t a n B r i c k w o r k s, Blackwood.

In the glacial till at this locality erratics of quartzite are very numerous. I have examined a considerable number, but have found a very surprising uniformity of characters amongst them. They are medium in grain, and are very dense and hard. In many of them nothing but clear quartz can be identified with a lens. In other examples there are abundant white specks, strikingly like the felspathic constituents of the Mitcham quartzites on casual observation. Closer observation shows that these patches are finely granular, and have a distinctly greasy lustre.

M i c r o s c o p i c c h a r a c t e r s.—Texture is uneven, but is not coarse. The most abundant constituent is always quartz, in rather rounded grains, almost all of which show rejuvenescence. In the densest rocks, those without the white spots, this secondary addition of quartz has completely filled all the original spaces; in the other rocks spaces have been left. A comparatively few composite grains are present, mostly fine-grained schists or granular quartz.

The patches of white material noted above are seen to consist of masses of fibrous material, generally with radial arrangement; its optical properties and behaviour with acids indicate antigorite. There is nothing to show from what primary mineral it has been derived.

xxxv. I n m a n V a l l e y.

A very remarkable rock formation has been found at intervals from this point on the south to Williamstown on the north. In its general appearance and its apparent stratigraphical relationships it is very strikingly suggestive of a repetition of the Cambrian glacial bed. Its characters are those of a conglomerate gneiss, though the degree of metamorphism varies very considerably. In the Inman Valley the boulders which exceed a foot in diameter have been much deformed by flowage. The groundmass is practically a coarse-grained mica schist, with well-marked "augen"

structure. The whole rock has been much jointed, the joint planes cutting sharply through groundmass and boulders indiscriminately. At Williamstown the metamorphism has been much more severe, so that in many places the rock becomes a somewhat friable mica gneiss. All the pebbles are much elongated, and in certain places it is difficult or impossible to distinguish where the pebble ends and the groundmass begins.

The rock under consideration is that which forms the boulders in the Inman Valley occurrence.

Macroscopic characters.—Dense, hard, greyish quartzite of rather fine grain. The individual constituents cannot be satisfactorily made out, but a black mineral is present.

Microscopic characters.—A completely granulated mass, consisting essentially of quartz, felspar, muscovite, and ilmenite. More than 50 per cent. of quartz, forming a perfect mosaic. Well-marked foliation. Strain has been relieved by perfect shattering, so that undulose extinction is not marked. Felspar is slightly decomposed and is all untwinned orthoclase, with no triclinic felspar at all. Muscovite about as abundant as felspar in granular aggregates and largeish plates. Fair amount of ilmenite in scattered, irregular grains. Numerous small crystals and grains of zircon and rutile, the latter exceptionally dark in colour. There is also a very little dark blue-brown tourmaline. (Plate xxxiv., fig. 3.)

xxxvi. Inman Valley. Groundmass of the above conglomerate.

Macroscopic characters.—As noted above, this groundmass is coarse in texture and gneissic in structure, with well-marked "auge" of quartz. It is very strongly micaceous, and a very conspicuous feature in it is the great abundance of ilmenite in large plates and grains. In some places the groundmass of the conglomerate contains nearly 50 per cent. of this mineral.

Microscopic characters.—Consist mainly of quartz and muscovite. The former occurs in large grains, showing evidence of crush in shadowy extinction and the presence of a "halo" of finely granulated material. "Augen" structure is even more marked than it is macroscopically. Much of the quartz is opalescent by reflected light. Some of the muscovite is in large plates, but most of it occurs in the form of minutely granular aggregates, in the most thoroughly comminuted parts of the rock. There is a good deal of ilmenite in irregular granular aggregates. Its lustre by reflected light is rather bright, and suggests magnetite, but the alteration around the edges into very typical "sagenite"

webs indicates its titaniferous character. All stages of alteration, from a mere peripheral zone to complete replacement by sagenite, occur. Tourmaline and zircon occur. (Plate xxxiv., fig. 4.)

xxxvii. Lake Eyre District, Upper Cretaceous (desert sandstone) formation.

Macroscopic characters.—Typical porcelainized desert sandstone. Light yellowish in colour and extremely tough, consists of rather fine, angular quartz fragments, cemented by fine, white, amorphous, opaline material. Very markedly conchoidal fracture.

Microscopic characters.—Larger fragments are of medium size, and are angular to subangular. Nearly all quartz, with only a few grains of microcline. Many of the particles exhibit strain phenomena, whose characters indicate that they were produced *before* the redistribution of the mineral; that is, that this rock has been formed from the materials of an older quartz rock which had undergone considerable pressure. It is almost certain that the older rocks must have been the Cambrian felspathic quartzites. A few cherty fragments are present. There are a fair number of broken crystals of zircon, and a very few grains of tourmaline and magnetite. A good deal of the interstitial material consists of very angular quartz grains down to submicroscopic dimensions. There is also a great deal of a white opaque substance, probably kaolin. The remainder is chiefly fine chalcedony, much of it showing evidence of the infilling of irregular cavities. In the centre of some of these cavities a little isotropic opal occurs, but only in very small quantities. There is no evidence of secondary outgrowth of quartz grains. (Plate xxxiv., fig. 5.)

xxxviii. William Creek.

An aboriginal chipping, picked up on the surface. From the great abundance of similar material in large angular pieces, evidently a local rock.

Macroscopic characters. — Perfectly homogeneous, structureless rock, of light greyish-yellow colour. Perfectly conchoidal fracture. Very tough and hard.

Microscopic characters. — Exceedingly fine grained. Mostly quartzose material so exceedingly fine in texture as to be almost unresolvable under the microscope. This is very variable in translucency; some of it is almost opaque, some quite transparent. It forms quite 90 per cent. of the bulk of the rock. The grains scattered through it, quite irregularly, are very sharp, angular splinters of quartz and an occasional zircon. This sharpness of the quartz grains is the most striking feature of the rock. They can have been

subjected to no attrition whatever, or, small as they are, they would have had the extremely sharp edges rounded off. The section, as a whole, shows very marked evidence of flow structure, quite like that so often seen in a rhyolite. It has evidently been caused to flow while in a plastic condition. There is no sufficient evidence upon which to ground the suggestion that this rock has had a glacial origin, but, considering its very peculiar structure and the great abundance and variety and large size of the erratics found throughout the desert sandstone of the Far North, the possibility of such an origin is well worthy of further investigation.

Summary.

Though the rocks which have been examined embrace only an exceedingly small proportion of the quartzites and sandstones of the State, they form a fairly representative collection, and certain fairly reliable conclusions may be drawn from the descriptions:—

1. The massive quartzites of the Mitcham formation (lying immediately under the Sturt glacial bed), in all their occurrences from Adelaide to Mount Remarkable, are characterised by abundance and variety of felspar, such as is shown by no rock beyond the limits of this formation.

2. The erratics from the glacial bed are certainly not fragments of Mitcham-Burnside quartzites, but somewhat resemble those from the Clarendon tunnel.

3. The quartzites associated with the archæocyathinæ bed (those of Sellick's Hill and Wilson) constitute another very definite type, quite distinct from those of Mitcham and Burnside.

4. The quartzites of the Mount Barker district are distinct from either of the above series.

5. The rock from King's Bluff, Olary, shows far more resemblance to those from Mount Barker than to those from near Adelaide.

6. The boulders in the Inman Valley conglomerate are very markedly different in character from the erratics in the glacial bed at Blackwood.

In conclusion, I wish to express my thanks to my friend and colleague, Mr. Howchin, for the keen interest he has taken in the work. Many of the types which have come under examination are from his private collection, the contents of which he placed unreservedly at my disposal.

I hope that the very incompleteness of the foregoing descriptions will cause some other worker to enter this field of investigation. I am sure that the interest of the work and the value of the results obtained will well compensate any one for the labour involved.

EXPLANATIONS OF PLATES.

Microphotographs of various types of quartzites described in the foregoing paper. In all cases the magnification is 15 diameters.

Plate XXXIII.

Fig. 1. Mitcham (i.). Crossed nicols. The particular point photographed is somewhat poor in felspar. Shows the completely interlocking arrangement of grains.

Figs. 2 and 3. Maitland Bore (xiv.). Fig. 2. is in ordinary light; fig. 3 the same portion of the section between crossed nicols. Show the very marked rejuvenescence of the quartz grains. In fig. 2 the outlines of the original grains are marked clearly by the rings of inclusions. In fig. 3 the optical continuity of the quartz *outside* these lines with that inside is apparent.

Fig. 4. Mr. Dinham's Farm, west of Ardrossan (xv.). Crossed nicols. Shows well the perfect rejuvenescence of quartz crystals and the infiltration with chalcedonic cement.

Fig. 5. Plain east of Mount Remarkable (xviii.). Ordinary light. Quartz and composite grains set in a fine base. The whole rock is crossed by a series of parallel, secondary solution-planes.

Fig. 6. Sellick's Hill. Crossed nicols. Show undulose extinction and marked tendency to cleave.

Plate XXXIV.

Fig. 1. Waterfall Gully (xxvii.). Ordinary light. Small rhombic sections, probably lazulite.

Fig. 2. Field River, near Hallett's Cove. Crossed nicols. Indicates irregularity of texture, strain phenomena, felspathic nature of rock, and (rather faintly) fibrous structure of calcareous cement.

Fig. 3. Inman Valley. Boulder from conglomerate gneiss (xxxv.). Ordinary light. Felspathic content and marked schistosity are shown.

Fig. 4. Inman Valley. Ground mass of conglomerate gneiss (xxxvi.). Crossed nicols. Shows the foliation of the rock and the optical evidence of strain, but does not exhibit well the "augen" structure.

Fig. 5. Lake Eyre District. Desert sandstone (xxxvii.). Angular quartz, set in a fine-grained ground mass, somewhat chalcedonic.

New Australian Lepidoptera, with Synonomic and other Notes.

A. Jefferis Turner, M.D., F.E.S.

[Read October 4, 1904.]

Family, ARCTIADÆ.

Heliosia charopa, n. sp.

(Charopos, bright, cheerful.)

Male, 20-22 mm. Head and palpi orange-ochreous. Antennæ fuscous; in male simple, moderately ciliated (1). Thorax dark fuscous; apices of patagia ochreous. Abdomen dark fuscous; basal segment mixed with ochreous; tuft orange-ochreous. Legs fuscous; middle femora and apices of middle tibiæ ochreous; posterior pair wholly ochreous. Forewings elongate-oval, costa moderately arched, apex rounded, termen very obliquely rounded; bright orange-ochreous; with two transverse dark fuscous fasciæ; first from one-third costa to before middle of dorsum, narrower on costa, broadening slightly in disc; second broader than first from costa before apex to tornus, with an outward projection beneath costa, followed by an inward projection above mid-disc; cilia dark fuscous. Hindwings with termen rounded; ochreous; a very broad dark fuscous terminal band, containing an ochreous dot at apex; cilia dark fuscous.

Type in Coll., *Turner*

N.Q., Townsville, in February, June, and October; five specimens, of which four were received from Mr. F. P. Dodd; one I captured myself.

Stenoscaptia phlogozona, n. sp.

(Phlogozonos, with fiery band.)

Male, 15 mm. Head bright yellow. Palpi whitish-ochreous. Antennæ pale fuscous; in male simple, moderately ciliated ($1\frac{1}{2}$). Thorax dull purple; tegulæ bright yellow. Abdomen fuscous. Legs ochreous; anterior pair somewhat infuscated. Forewings elongate-oblong, costa rather strongly arched, apex rounded, termen straight, slightly oblique; purple, with metallic reflections; a broad antemedian bright yellow fascia with straight edges; a narrow, bright yellow terminal band, broadest on costa, indented beneath costa, coming to a point at tornus; cilia bright yellow. Hindwings with termen rounded; whitish, thinly scaled; a broad fuscous terminal band; cilia fuscous.

Type in Coll., *Turner*.

N.Q., Townsville, in March; one specimen, received from Mr. F. P. Dodd.

Family, NOCTUIDÆ.

I agree with Mr. Lower in regarding *Grammodes clementi*, Swin., as a synonym of *Grammodes pulcherrima*, Luc., and *Marapana rhodea*, Turn., as a synonym of *Prionophora rhodinastis*, Meyr.

Section, AGROTINÆ.

Genus, Propatria.

Propatria, Hmps., Cat. Lep. Phal. iv., p. 651.

Both species referred to this genus have a single apical hook on fore tibiæ. This would materially alter the position of the genus in Sir G. Hampson's tabulation.

Adisura marginalis.

Anthophila marginalis, Wlk., Brit. Mus. Cat. xii., p. 830.

Adisura marginalis, Hmps., Cat. Lep. Phal. iv., p. 121.

N.A., Port Darwin; N.Q., Townsville; Q., Brisbane. Also from India.

Section, CARADRININÆ.

Euplexia chloeropis, n. sp.

(*Chloëropis*, greenish-looking.)

Male, 40 mm. Head whitish. Palpi whitish, upper surface brownish; second joint annulated with dark fuscous. [Antennæ broken.] Thorax brownish, with some whitish scales. Abdomen grey; apices of segments and tuft ochreous Legs whitish ochreous, mixed with pinkish-brown and fuscous. Forewings elongate-triangular, costa straight, termen bowed, slightly oblique; brownish, mixed with whitish and fuscous; a whitish spot at base of costa and a second spot, bisected by a fuscous line, on costa near base, both partly suffused with greenish; orbicular greenish, with a few central fuscous scales; reniform similar, but more obscure; a fine dentate, blackish, post-median line, from three-quarters costa to three-quarters dorsum; a suffused whitish apical spot, from which a faint whitish line proceeds to tornus; an interrupted dark fuscous terminal line; cilia, bases green-whitish, apices grey. Hindwings with termen rounded; dark fuscous; cilia whitish, bases fuscous near apex. Under side of forewings fuscous, with a pinkish-brown costal streak; of hindwings whitish-ochreous, with a dark fuscous discal dot and broad terminal band.

Type in Coll., *Turner*.

Q., Biggenden; one specimen, received from Mr. H. Tryon.

PROMETOPUS RUBRISPERSA, n. sp.

(*Rubrispersus*, speckled with red.)

Female, 30-32 mm. Head, thorax, and palpi pale reddish, irrorated with dark fuscous. Antennæ ochreous-whitish. Abdomen pale grey. Legs, dark fuscous, irrorated and annulated with whitish. Forewings elongate-triangular, costa scarcely arched, apex round-pointed, termen moderately oblique, slightly bowed, slightly crenulate; fuscous intimately mixed with blackish, whitish, and reddish scales, the last varying in depth of colour in different individuals; lines interrupted and indistinct, indicated by blackish scales, edged posteriorly by pale scales; two or three short sub-basal lines from costa to fold; an antemedian and a postmedian line; six to eight whitish dots on costa; orbicular reddish-white, edged thinly with blackish scales, circular; reniform similar in coloration as far as its median portion, the upper and lower parts obsolete, or faintly indicated by a thin, blackish outline: a fine, dark fuscous, terminal line; cilia fuscous, mixed with pale reddish. Hindwings with termen rounded, wavy; grey, paler towards base; cilia whitish.

Type in Coll., *Turner*.

Q., Brisbane, Toowoomba; four specimens.

PROMETOPUS XERAMPELINA, n. sp.

(*Xerampelinos*, reddish.)

Female, 35 mm. Head, thorax, and palpi pale reddish, with scattered fuscous scales. Abdomen pale reddish-ochreous irrorated with fuscous. Legs pale reddish, irrorated, and tarsi annulated with dark fuscous. Forewings elongate-triangular, costa nearly straight, termen bowed, oblique, slightly crenulate; pale reddish, irrorated with fuscous; a narrow fuscous antemedian line from one-quarter costa to two-fifths dorsum, outwardly curved, slightly dentate; orbicular obsolete, reniform very faintly indicated; a narrow, fuscous, dentate postmedian line from mid-costa to three-fifths dorsum, outwardly curved in upper two-thirds; a sub-terminal series of pale reddish dots; terminal edge fuscous; cilia reddish barred by dark fuscous irroration. Hindwings with termen slightly sigmoid; whitish; towards termen suffused with fuscous; cilia whitish, tinged with reddish.

Type in Coll., *Turner*.

W.A., Coolgardie; one specimen.

PROMETOPUS INASSUETA.

Prometopus inasseuta, Gn., Lep. v. p. 38, pl. iii., fig. 9.
Caradrina chromoneura, Turn., P.L.S.N.S.W., 1902, p. 86.
Erastroides lichnomima, Turn., P.L.S.N.S.W., 1902, p. 110.
Q., Brisbane; T., Launceston, Ulverstone.

Queensland specimens have the forewings suffused with green, especially towards base, and the ochreous streaks on veins are replaced by green.

PROMETOPUS NODYNA.

(*Nodunos*, pleasing.)

Male, 30 mm. Head and thorax white, intimately mixed with dark fuscous. Palpi white, with a broad, median, dark fuscous ring. Abdomen grey-whitish. Legs whitish, irrorated, and tarsi annulated with dark fuscous. Forewings elongate-triangular, costa nearly straight, termen bowed; whitish, irrorated and suffused with fuscous; a short, dark-fuscous, longitudinal streak from base of costa; a fuscous dot on costa near base; an interrupted fuscous line from one-sixth costa to one-fourth dorsum; followed by a similar line, which joins it before dorsum; a suffused straight fuscous fascia from mid costa to beyond mid-dorsum; orbicular and reniform obsolete; an outwardly curved, whitish line from three-quarters costa, margined posteriorly by a fuscous line, both lost in disc; a whitish, dentate, subterminal line; a dark fuscous spot on termen above tornus; cilia white, barred with dark fuscous. Hindwings with termen rounded; whitish-grey; cilia whitish, with an interrupted median fuscous line.

Type in Coll., *Turner*.

Q., Brisbane, in February; one specimen.

Section, NOCTUINÆ.

CORULA DELOSTICHA, n. sp.

(*Delostichos*, with conspicuous lines.)

Male, 22 mm. Head and palpi dark brown. Antennæ pale grey; in male with long bristles (3), and shorter cilia (1). Thorax grey-whitish, mixed with some brownish scales; collar ochreous-brown, edged posteriorly with dark brown. Abdomen pale grey; extreme base and tuft whitish. Legs whitish-grey; anterior pair fuscous. Forewings elongate, costa gently arched, apex rounded, termen bowed, slightly oblique; grey-whitish; all veins marked by very distinct, dark fuscous lines; a transverse brownish-fuscous fascia, edged posteriorly by dark fuscous, at two-thirds; cilia grey-whitish, barred by prolongations of lines on disc. Hindwings with termen sigmoid, rather strongly incurved beneath

apex, thence rounded; whitish, towards termen broadly fuscous; cilia whitish, obscurely barred with fuscous.

A neat and very distinct species. Type in Coll., *Illidge.*

Q., Eumundi, near Nambour. One specimen, bred from *Casuarina*, by Mr. R. Illidge.

Praxis alampeta, n. sp.

(*Alampetos*, dark, unlightened.)

Female, 32 mm. Head and palpi dark fuscous, mixed with pinkish-white. Thorax dark fuscous, mixed with brown-whitish. Abdomen dark fuscous, irrorated with white; a small pinkish tuft on mid-dorsum. Legs dark fuscous, irrorated with whitish; posterior pair mostly whitish; tarsi annulated with pinkish-white. Forewings triangular, costa straight, termen bowed, slightly oblique, crenulate; dark fuscous, irrorated with whitish; in basal half are several ill-defined, waved, blackish, transverse lines; an obscure 8-shaped whitish spot beneath one-third costa, connected by a whitish suffusion with dorsum; an obscure, finely dentate, white, postmedian line, and a similar more distinct subterminal line; a blackish terminal line, preceded by a series of whitish dots, cilia fuscous, mixed with whitish. Hindwings with termen rounded, crenulate; dark fuscous; base whitish; a white line from two-thirds dorsum nearly to costa; a short, nearly parallel, white line from tornus; terminal line and cilia as in forewings

But for the abscence of red scales on the wings this is very similar to *marmarinopa*, Meyr.

Type in Coll., *Turner.*

Q., Brisbane, in January. One specimen.

Lyncestis macrosticha, n. sp.

(*Macrostichos*, long-streaked.)

Male, 48 mm. Head and palpi whitish, irrorated with a few brownish scales; terminal joint of palpi annulated with dark fuscous. Antennæ ochreous-fuscous, towards base whitish; in male shortly laminate, very shortly ciliated ($\frac{1}{3}$). Thorax grey-whitish; collar whitish, irrorated with brownish, with a median blackish transverse line; posterior crest well marked, brownish tinged. Abdomen whitish, apices of segments ochreous, basal crests grey-brownish. Legs whitish, irrorated with brownish and fuscous. Forewings elongate, costa straight, termen bowed, oblique, crenulate; white, suffused with grey; a blackish streak from base beneath cell and vein two to termen; a similar streak from end of cell becoming suffused and bent upwards near termen; a V-shaped, blackish, suffused mark resting on termen above termination

of first streak; veins partly slenderly outlined by blackish scales; cilia grey. Hindwings with termen rounded; white, translucent; a broad, dark fuscous apical blotch extending to mid-termen; cilia white, interrupted by dark fuscous on mid-termen. Under side of forewings white, with a large, subterminal, dark fuscous blotch; of hindwings similar to upper side.

Type in Coll., *Turner*.

N.Q., Townsville, in February. One specimen, received from Mr. F. P. Dodd.

ISCHYJA PORPHYREA, n. sp.

(*Porphureos*, purple.)

Male, 66-70 mm. Head and palpi dark fuscous. Antennæ fuscous; in male moderately bipectinated (2), terminal one-fifth serrate. Thorax dark fuscous, with a purple sheen. Abdomen dark fuscous. Legs dark fuscous, with a few whitish hairs; femora and tibiæ densely hairy; tarsi with whitish annulations. Forewings triangular, costa straight to near apex, then strongly arched, apex acute, slightly produced, termen nearly straight, oblique; dark fuscous, with a brilliant purple sheen not extending to termen; a very few scattered whitish scales; a small, brownish-ochreous spot beneath costa beyond middle; a series of whitish dots from three-quarters costa, ending in a small, suffused brownish-ochreous blotch above dorsum; cilia pale ochreous. Hindwings with termen slightly rounded; colour, subterminal dots, and cilia, as forewings.

Type in Coll., *Turner*.

N.Q., Thursday Island. Kuranda (Dodd). Three specimens.

Section, ERASTRIANÆ.

ERASTRIA RHAPTINA, n. sp.

(*Rhaptinos*, embroidered.)

Male, female, 19-20 mm. Head and thorax whitish, with some fuscous scales. Palpi fuscous. Antennæ whitish; in male shortly ciliated ($\frac{1}{2}$). Abdomen ochreous-whitish; with a single, small, erect, basal crest tipped with fuscous. Legs fuscous, mixed with whitish. Forewings triangular, costa nearly straight, termen bowed, oblique; pale fuscous, mixed with white; a series of six white dots on costa, with a larger dot on apex; a double white antemedian line from dorsum before middle, inwardly oblique, not reaching costa; orbicular, 8-shaped, white, with a few central dark scales; reniform similar, but larger; a slightly sigmoid double white line from four-fifths costa to two-thirds dorsum; an irregu-

larly whitish terminal band, partly suffused with fuscous; an interrupted, dark fuscous, terminal line; cilia whitish, bases mixed with fuscous. Hindwings with termen rounded; whitish, with slight fuscous suffusion towards termen; a narrow, fuscous terminal line; cilia whitish.

I hardly think this is a true *Erastria.*

Type in Coll., *Turner.*

N.Q., Thursday Island. Five specimens.

MEGALODES HEDYCHROA, n. sp.

(*Heduchroos,* pleasantly coloured.)

Male, 22 mm. Head whitish, with a posterior white-centred black spot; face ochreous-fuscous, with an acute, anteriorly projecting, corneous process, slightly bifid at apex. Palpi dark fuscous, apex of second joint narrowly whitish. Antennæ whitish-ochreous; in male shortly ciliated ($\frac{1}{2}$). Thorax pinkish-white; collar black, with some pinkish-white and brown scales. Abdomen grey, apices of segments and tuft pale ochreous. Legs ochreous-whitish; anterior and middle pairs annulated with dark fuscous. Forewings elongate-triangular, costa straight to near apex, where it is strongly arched, termen bowed, oblique; pinkish-white; a narrow transverse black line from costa near base to fold; a rather large black spot on one-fourth costa, followed by a fine, wavy, black line extending to two-fifths dorsum; a similar line from two-thirds costa bent first outwardly, then inwardly to two-fifths dorsum; a leaden grey suffusion on dorsum between transverse lines, connected by a pale grey line with costa; a large, oval, pale grey spot within postmedian line; a black blotch on costa before apex, and two black spots before tornus; cilia whitish, on mid-termen and tornus leaden grey. Hindwings with termen rounded; grey; cilia grey.

Type in Coll., *Turner.*

Q., Dalby. One specimen.

AXIORATA GLYCYCHROA, n. sp.

(*Glucuchroos,* sweetly coloured.)

Female, 19 mm. Head and thorax pinkish-white, irrorated with fuscous; frons prominent, rounded. Palpi fuscous. Antennæ fuscous. Abdomen fuscous, irrorated with whitish. Legs fuscous, irrorated, and tarsi annulated, with whitish. Forewings triangular, costa slightly arched, apex rounded, termen rounded, oblique; pinkish-white; base, costa, and termen densely irrorated with dark grey; a reddish spot near base of costa; a broad, median, dark grey fascia, edged by dentate lines, which are reddish, mixed with dark fuscous; cilia dark grey, with a series of whitish dots

on bases. Hindwings with termen rounded; dark grey, cilia grey.

The genus *Axiorata* (Turn., P.L.S.N.S.W., 1902, p. 120) agrees with *Pachylepis* (Hmps., Moths Ind., ii., p. 337) in the non-crested abdomen and stalking of veins 7, 8, 9, 10 of forewings, but differs in the stalking of 3 and 4 and 6 and 7 of hindwings.

Type in Coll., *Turner.*

N.Q., Thursday Island. One specimen.

Section, HYPENINÆ.

Nodaria aneliopis, n. sp.

(Aneliopis, gloomy looking.)

Female, 28-30 mm. Head, thorax, palpi, and antennæ fuscous. Abdomen fuscous mixed with whitish. Legs fuscous, with some whitish scales. Forewings elongate-triangular, costa nearly straight, termen bowed, slightly oblique; fuscous; a dark fuscous median discal dot; a wavy darker line, succeeded by a pale line, from five-sixths costa to five-sixths dorsum; a terminal series of minute, dark fuscous dots; cilia fuscous. Hindwings with termen rounded, slightly indented beneath apex; pale fuscous; cilia fuscous whitish.

In this species and in *Nodaria armatalis*, Wlk., vein 5 of hindwings arises from close to lower angle of cell, but both have the characteristic palpi of *Nodaria*, and so differ from the genus *Simplicia.*

Type in Coll., *Turner.*

N.Q., Thursday Island, Townsville. Three specimens.

Family, GEOMETRIDÆ.

Sub-Family, GEOMETRINÆ.

Euchloris periphracta, n. sp.

(Periphraktos, fenced around.)

Male, female, 24-28 mm. Head ochreous; fillet whitish; face reddish-ochreous. Palpi ochreous. Antennæ whitish; in male with long pectinations (6), apical fourth simple. Thorax green; collar and bases of patagia ochreous; a median ochreous spot, continuous with abdominal streak. Abdomen green, towards apex whitish; a median ochreous streak, becoming obsolete posteriorly; beneath whitish. Legs whitish; anterior and middle pairs brownish anteriorly, except anterior coxæ, which are ochreous. Forewings triangular, costa straight, slightly arched towards apex, apex tolerably pointed, termen nearly straight, oblique; green, inclining to bluish-green; a broad, deep-ochreous costal streak, costal

edge paler; a whitish-ochreous wavy line from beneath one-third costa to two-fifths dorsum; a similar line from beneath two-thirds costa to three-fifths dorsum; discal dot represented by a very fine, short, transverse streak, running into costal streak; cilia deep-ochreous, on dorsum green. Hindwings with termen angled on vein 4; colour as forewings; a distinct, narrow, transversely elongate ochreous discal dot; a finely dentate, whitish-ochreous posterior line; cilia as forewings, but ochreous also on dorsum.

Type in Coll., *Turner*.

Q., Stradbrooke Island, in October. Six specimens, beaten from *Banksia serratifolia*.

EUCHLORIS ARGOSTICTA, n. sp.

(*Argostictos*, speckled with white.)

Male, female, 24-30 mm. Head and fillet green; face green, margins narrowly white. Palpi green, towards base whitish. Antennæ whitish, towards base green; in male with very long pectinations (10), apical third simple. Thorax green; collar white. Abdomen green, with some white median dots on dorsum, better marked in female, towards apex whitish. Legs whitish; femora barred anteriorly with green, tibiæ and tarsi with fuscous. Forewings triangular, costa gently arched, apex tolerably pointed, termen slightly rounded, oblique; green, with fine, white, transverse strigulæ, rather sparsely distributed; a fine shining white costal streak; a fuscous discal dot, bordered with whitish, slightly beyond middle; cilia green, apices whitish. Hindwings with termen rounded; colour and markings as forewings.

Type in Coll., *Turner*.

N.Q., Townsville; in January, February, and July. Three specimens, received from Mr. F. P. Dodd.

EUCHLORIS TANYGONA, n. sp.

(*Tanugonos*, long-angled; in allusion to hindwings.)

Male, 26 mm. Head green; fillet snow-white; face ochreous, upper edge brownish-ochreous. Palpi brownish-ochreous. Antennæ white; in male with rather long pectinations (5), apical fifth simple. Thorax green; abdomen green; sides and inferior surface whitish. Legs whitish; anterior tibiæ and tarsi brownish tinged. Forewings triangular, costa moderately arched, apex round-pointed, termen slightly crenulate, slightly bowed, oblique; rather dull green; costal edge near base brownish-ochreous, thence narrowly white; a circular, brownish-fuscous dot in disc at one-third; two similar dots on dorsum

at and before middle; a brownish-fuscous terminal line; cilia white, barred with brownish-fuscous, opposite veins. Hind-colour markings and cilia as forewings, but discal dot larger, and only one dot on dorsum.

Type in Coll., *Turner.*

Q., Mount Tambourine; in November. One specimen.

EUCHLORIS THALASSICA, n. sp.

(*Thalassikos*, sea-green.)

Female, 22 mm. Head dull green; face whitish, above greenish tinged; fillet narrowly white. Palpi rather long (2), ascending; whitish. Antennæ fuscous, towards base white. Thorax and abdomen dull green. Legs whitish; anterior pair greenish tinged. Forewings triangular, costa strongly arched at base, thence nearly straight, apex round-pointed, termen bowed, oblique; dull green; a few minute fuscous dots on costa; a very faint darker-green discal dot at one-third; a faint, wavy, whitish line from two-thirds costa to two-thirds dorsum; cilia pale green. Hindwings with termen angled and produced in a strong tooth on vein 4; colour and cilia as forewings; a well-marked, transversely elongate, dark green discal dot at one-sixth; a faint, whitish, straight, transverse line before middle. Under side pale green, with fuscous green discal dots, and a broad, subterminal fascia, not quite reaching costa of forewing and inner margin of hindwing.

Type in Coll., *Turner.*

N.Q., Kuranda; in March. One specimen, received from Mr. F. P. Dodd.

EUCHLORIS LEUCOSPILOTA, n. sp.

(*Leucospilotos*, spotted with white.)

Male, 24 mm. Head white; face whitish, upper portion green. Palpi moderate ($1\frac{1}{4}$): whitish, upper surface of second joint green. Antennæ whitish-ochreous, base of shaft white: in male with very long pectinations (10), apical two-fifths simple. Thorax and abdomen green, spotted with white. Legs white; anterior and middle pairs greenish anteriorly. Forewings triangular, costa moderately arched, apex rounded, termen slightly wavy, rounded, oblique; green, with numerous large white spots, more or less confluent, towards termen these form two broadish fasciæ, separated by a green line; cilia whitish, mixed with green. Hindwings with termen wavy, toothed on vein 6, and again more prominently on vein 4; colour, spots, and cilia as forewings. Under side white.

Type in Coll., *Turner.*

N.Q., Kuranda; in March. One specimen, received from Mr. F. P. Dodd.

EUCHLORIS CALLISTICTA, n. sp.

(*Callistiktos*, beautifully spotted.)

Male, 23 mm. Head green; face white, upper third green. Palpi moderate ($1\frac{1}{2}$), ascending; whitish. Antennæ white, apices and pectinations fuscous; in male with moderate pectinations (3), apical two-fifths simple. Thorax and abdomen green, with white spots. Legs white; anterior pair broadly barred with fuscous anteriorly. Forewings triangular, costa moderately arched, apex rounded, termen crenulate, rounded, oblique; green, irrorated with white (green hair scales on a white ground); costa narrowly fuscous, speckled with white; a subterminal series of white spots, succeeded by a few submarginal spots; a terminal series of white dots; cilia green. Hindwings with termen dentate, rounded; colour, spots, and cilia as forewings, but with less white irroration towards base and more numerous spots. Underside whitish; costa of forewings fuscous.

Type in Coll., *Turner*.

N.Q., Kuranda; in March. One specimen, received from Mr. F. P. Dodd.

EUCHLORIS VERTUMNARIA.

Mr. D. Goudie has bred this species from larvæ feeding on *Acacia hakeoides*.

PSEUDOTERPNA BRYOPHANES, n. sp.

(*Bruophanes*, like moss, moss-green.)

Female, 35 mm. Head and face whitish-ochreous, mixed with green. Palpi dark fuscous, towards base beneath whitish-ochreous. Antennæ ochreous-whitish, with some blackish scales towards base. Thorax green, with a transverse, dark fuscous line behind collar. Abdomen ochreous-whitish, with a few dark fuscous scales. Legs ochreous-whitish, annulated with dark fuscous. Forewings triangular, costa straight nearly to apex, apex rounded, termen wavy, rounded, oblique; green, mixed with whitish-ochreous, the latter preponderating towards base and on veins; markings blackish; numerous dots on costa; an interrupted basal line; a rather diffused line from one-quarter costa to one-third dorsum; several dots beneath mid-costa representing a narrow, transversely elongate discal spot; a line from three-quarters costa obliquely outwards, bent in disc to form an obtuse, twice-angled projection, thence inwardly oblique and slightly dentate to before mid-dorsum; some scattered blackish scales beyond posterior line; an interrupted terminal line thickened between veins; cilia green, mixed with whitish-ochreous, and interrupted with fuscous. Hindwings with

termen crenulate, rounded; veins 6 and 7 separate; colour and markings as forewings, but basal and antemedian line absent. Under surface ochreous-whitish, with dark grey lines as on upper surface; posterior part of disc faintly reddish and irrorated with dark grey.

Type in Coll., *Turner.*

Q., Sandgate (?), near Brisbane. One specimen. There is a doubt as to the locality, as the friend from whom I received it had been recently visiting Gayndah, and might have taken it there, but he thinks not.

Pseudoterpna myriosticta, n. sp.

(*Muriostiktos*, many-speckled.)

Female, 34 mm. Head whitish; face rounded and rather prominent, lower third and a transverse line above middle blackish. Palpi fuscous, lower surface of basal and second joints whitish. Antennæ pale grey, with some fuscous scales in basal half. Thorax and abdomen white, sparsely irrorated with black scales. Legs fuscous; tarsi annulated with whitish; posterior pair whitish. Forewings triangular, costa arched near base and apex, apex rounded, termen wavy, rounded, oblique; white, with scattered, dark fuscous scales; towards costa ochreous-whitish; an interrupted basal fascia; a broad, dark fuscous fascia, containing some reddish scales, at one-quarter, closely followed by a slender looped dark fuscous line; a black linear discal mark beneath mid-costa; a second suffused fascia, like the first, from five-sixths costa to three-quarters dorsum, interrupted above dorsum, where it is preceded by a slender, dark fuscous line; to this succeeds a dentate white subterminal line, edged posteriorly with dark fuscous; a terminal series of black dots between veins; cilia white. Hindwings with termen wavy, rounded; veins 6 and 7 separate; colour and irroration as forewings, but without fasciæ; a line of raised scales in disc anteriorly white, posteriorly black, represents the discal spot, and is continued to mid-dorsum. Under surface whitish, washed with pale reddish; a broad terminal blackish band; discal dot of forewings large, oval, black, of hindwings minute.

Type in Coll., *Turner.*

Q., Eumundi, near Nambour: in November. One specimen.

Sub-Family, MONOCTENIANÆ

Taxeotis acrothecta, n. sp.

(*Acrothektos*, sharp-pointed.)

Male, female, 21-24 mm. Head grey-whitish; face dark fuscous. Palpi rather short ($1\frac{1}{4}$); dark fuscous. Antennæ

whitish, in male dentate, shortly ciliated ($\frac{2}{3}$). Thorax and abdomen grey-whitish, with a very few dark fuscous scales. Legs whitish, sparsely irrorated with fuscous. Forewings triangular, costa straight, slightly arched close to base and apex, apex acute, slightly produced, termen sinuate, oblique; 11 connected with 12; grey-whitish, with a few scattered dark fuscous scales; a transverse line at one-quarter in female, in male scarcely indicated; a dark fuscous discal dot beneath mid-costa; a ferruginous-fuscous line from beneath four-fifths costa to three-quarters termen; in male interrupted; followed immediately by a whitish line, best marked in female; a series of black, terminal dots; cilia grey-whitish. Hindwings with termen rounded; colour and markings as forewings, but without basal line.

Type in Coll., *Turner.*

N.Q., Townsville; in August. Three specimens, received from Mr. F. P. Dodd.

Taxeotis orphnina, n. sp.

(*Orphninos*, dusky.)

Male, 23 mm. Head grey; face dark fuscous. Palpi moderate ($1\frac{1}{2}$); dark fuscous. Antennæ ochreous whitish; in male distinctly laminate, with rather long ciliations (2). Thorax grey. Abdomen pale grey, with a few fuscous scales. Legs whitish; anterior and middle pairs irrorated with fuscous. Forewings triangular, costa gently arched, apex acute, termen sinuate, oblique; 11 connected with 12; pale grey, with a few scattered black scales; costal edge ochreous-whitish; a dark fuscous spot on costa at one-third, and another at two-thirds; a black discal dot beneath mid-costa; a ferruginous-fuscous interrupted line from beneath four-fifths costa to three-quarters dorsum; a fuscous spot near dorsum posterior to this; a series of blackish terminal dots; cilia grey whitish. Hindwings termen rounded; as forewings, but lines obsolete.

Female, 23 mm., differs in having the wings uniformly suffused with fuscous.

Type in Coll., *Turner.*

Q., Mount Tambourine; in March. Two specimens.

Taxeotis adelpha, n. sp.

(*Adelphos*, brotherly, closely akin.)

Male, 23 mm. Head grey; face dark fuscous. Palpi moderate ($1\frac{2}{3}$); dark fuscous. Antennæ grey-whitish; in male scarcely laminate, with short ciliations ($\frac{2}{3}$). Thorax grey. Abdomen [broken]. Legs whitish, irrorated with fuscous. Forewings triangular, costa gently arched, apex toler-

ably acute, termen rounded, oblique; 12 free; pale grey, with sparsely scattered black scales; costal edge ochreous-whitish; a fuscous spot on costa at one-third, and another at two-thirds; two or three dots connecting first costal spot with dorsum; a fuscous discal dot beneath mid-costa; a sinuate, ferruginous-fuscous line from beneath four-fifths costa to three-quarters dorsum; preceded by some dark fuscous dots, and succeeded by dark fuscous irroration and a series of dark fuscous spots; a series of black terminal dots; cilia pale grey. Hindwings with termen rounded; as forewings, but lines obsolete.

Extremely similar to the preceding, but readily distinguished by the male antennæ. The shape and neuration of forewings are also somewhat different.

Type in Coll., *Turner.*

N.S.W., Katoomba district; in February. One specimen.

TAXEOTIS EPIGAEA, n. sp.

(*Epigaios*, resting on the ground.)

Male, 38 mm. Head pale reddish-ochreous; face dark fuscous, tinged with ferruginous. Palpi rather short ($1\frac{1}{4}$); dark fuscous; antennæ ochreous-fuscous; in male slightly laminate, with moderate ciliations (1). Thorax and abdomen pale reddish-ochreous; apical half of abdomen grey. Legs ochreous-whitish, irrorated with fuscous; anterior and middle tibiæ and tarsi dark fuscous anteriorly. Forewings triangular, costa nearly straight, apex tolerably acute, termen bowed, slightly oblique; 12 free; pale reddish-ochreous with dark fuscous irroration tending to form transverse strigulæ, a fuscous dot on costa at one-third and another at two-thirds; a slender, pale line from beneath four-fifths costa to three-quarters dorsum, preceded by a series of dark fuscous dots; a terminal series of dark fuscous dots; cilia pale reddish-ochreous. Hindwings with termen rounded; colour and markings as forewings.

The colour of this species harmonises with the red earth of the locality in which it was captured.

Type in Coll., *Turner.*

Q., Mount Tambourine; in November. One specimen.

Genus, PROROCRANIA.

(*Prorocranios*, prow-headed.)

Face with strong anterior convexity. Tongue well developed. Palpi rather long; second joint long, obliquely ascending; terminal joint short, porrect. Antennæ in male with a double series of pectinations extending nearly to apex,

outer pectinations longer than inner. Forewings rather elongate, 11 anastomosing with 10, 10 anastomosing with 8 and 9; 7, 8, 9 stalked. Hindwings with 6 and 7 connate.

PROROCRANIA ARGYRITIS, n. sp.

(*Arguritis*, silvery.)

Male, 38 mm. Head and palpi dark grey. Antennæ dark grey, with a rather long series of outer pectinations (5), and shorter inner pectinations (3). Thorax dark grey; inner edge of patagia blackish. Abdomen grey. Legs dark fuscous; posterior pair grey. Forewings elongate-triangular, costa straight except close to base and apex, apex rounded, termen rounded, strongly oblique; dark grey; a short, blackish streak from base, broadly dilated and dentate posteriorly, edged above with silvery white; an acutely dentate antemedian line, interrupted at costa and on mid-disc, blackish, edged with brownish and silvery white; veins before this marked with blackish streaks; a postmedian line from five-sixths costa, at first straight and inwardly oblique, then strongly dentate, and ceasing abruptly in mid-disc, silvery white, edged anteriorly with blackish; an interrupted dentate, blackish, subterminal shade; terminal veins with blackish streaks; a series of elongate, silvery white spots on termen, some of them bisected by black; cilia dark fuscous, barred with white. Hindwings rather elongate, termen nearly straight, except towards costa and tornus; pale grey; a grey discal dot in cell; cilia grey.

Type in Coll., *Turner*.

W.A., Albany; in August. One specimen, captured and presented to me by Mr. J. J. Walker.

NEARCHA URSARIA.

Panagra ursaria, Gn. Lep. x., p. 129.
Nearcha oxyptera, Low., Tr.R.S.S.A., 1903, p. 188.
Q., Brisbane, Stradbroke Island.

NEARCHA PROSEDRA, n. sp.

(*Prosedros*, sitting near, closely akin.)

Male, female, 29-32 mm. Head grey; face blackish. Palpi moderate ($2\frac{1}{2}$); blackish; towards base sharply white. Antennæ grey; in male with a double series of long pectinations (6). Thorax and abdomen grey. Legs grey; posterior pair whitish; in male posterior femora are fringed with long hairs on inferior surface, posterior tibiæ much dilated and grooved on internal surface. Forewings triangular, costa scarcely arched, apex pointed, termen gently sinuate, slightly oblique; grey, with a very few scattered fuscous scales; a transversely oval dark fuscous discal dot, with grey centre

beneath costa before middle; a fine sinuate whitish line from beneath three-quarters costa to three-quarters dorsum, preceded by a series of fine black dots, and succeeded by a broad, dark grey shade; a terminal series of black dots; cilia grey. Hindwings with termen rounded; in male with a large fovea in end of cell, preceded by a curled tuft of long, fuscous hairs, succeeded by a tuft of shorter fuscous hairs, and bounded internally by a high ridge of pale grey hairs; as forewings, but without markings or with a faint, pale transverse median line only.

The palpi are longer than in *buffalaria* (2), shorter than in *ursaria*. The male may be distinguished from *ursaria* by the absence of any hairy patch on the underside of forewings, and from *buffalaria* by the steep ridge of hairs on the inner side of the fovea on the hindwings.

Type in Coll., *Turner*.

Q., Stradbroke Island; in November and December. Eight specimens.

NEARCHA NEPHOCROSSA, n. sp.

(*Nephokrossos*, with cloudy border.)

Male, 32 mm. Head whitish-grey; face blackish. Palpi moderate (2); blackish; towards base sharply white. Antennæ grey, toward base mixed with white; in male with a double series of very long pectinations (10). Thorax and abdomen whitish-grey. Legs grey; [posterior pair broken]. Forewings triangular, costa straight, except close to base and apex, apex rounded, termen bowed, oblique; whitish-grey, rather closely irrorated with dark grey; a dark fuscous streak along costa from base to one-quarter; a pale transverse line at one-quarter; a fuscous discal spot beneath costa before middle; a clearly defined, sinuate, whitish-grey line from three-fifths costa to three-quarters dorsum; preceded by a series of dark fuscous dots; and succeeded by a broad, dark grey fascia, its outer edge crenate; terminal part of disc whitish-grey, with a series of suffused fuscous spots; a terminal series of black dots; cilia whitish-grey. Hindwings with termen rounded; in male without tufts beneath; dark grey; with two transverse, pale grey lines, one median, one subterminal; terminal dots and cilia as forewings.

Type in Coll., *Turner*.

Q., Burpengary, near Brisbane; in April. One specimen.

Gen. ZEUCTOPHLEBIA.

Zeuctophlebia, Warr., Nov., Zool., 1896, p. 355.

Face without projecting tuft. Tongue present. Palpi moderate ($1\frac{1}{2}$), porrect, terminal joint very short. Antennæ of male with a double row of long pectinations, apical one-

sixth simple. Forewings with 7, 8, 9, 10 stalked, 11 anastomosing with 12, 10 arising from 11, beyond anastomosis, and anastomosing with 9, forming a single areole. Hindwings with 6 and 7 separate.

Type, *Z. rufipalpis.*

Zeuctophlebia rufipalpis.

Zeuctophlebia rufipalpis, Warr., Nov. Zool., 1896, p. 355.

Q., Nambour, Brisbane, Toowoomba; from September to December.

Zeuctophlebia tapinodes, n. sp.

(*Tapinodes*, of humble appearance.)

Male, 24 mm. Head and palpi grey. Antennæ grey; in male with a double series of long pectinations (8), apical one-sixth simple. Thorax, abdomen, and legs grey. Forewings triangular, costa gently arched, apex round-pointed, termen bowed, oblique; pale grey sparsely irrorated with dark grey; costal edge dark grey in basal half; a dark fuscous discal dot beneath costa before middle; a very fine, dark, dentate line from three-quarters costa to three-quarters dorsum; a terminal series of fuscous dots; cilia pale grey. Hindwings with termen slightly wavy, rounded; colour and markings as forewings.

Type in Coll., *Turner.*

Q., Stradbroke Island. One specimen.

Genus, Encryphia, nov.

(*Encruphios*, hidden, concealed.)

Head flat, not tufted. Palpi moderate, porrect, densely haired, terminal joint concealed. Antennæ in male with a double row of moderate pectinations nearly to apex, each pectination bearing a terminal bristle. Posterior tibiæ in male dilated, with a groove on inner side, containing a long tuft of hairs from base. Forewings with 7, 8, 9, 10 stalked, 10 arising before 7, anastomosing with 11, and then with 8 and 9 forming a double areole, 11 anastomosing with 12. Hindwings with 6 and 7 connate or separate, 8 approximated to cell as far as middle.

Encryphia argillina, n. sp.

(*Argillinos*, like clay, clay-coloured.)

Male, female, 29-34 mm. Head ochreous-grey; face dark brown. Palpi moderate ($1\frac{3}{4}$); dark brown. Antennæ dark grey; in female paler; in male with moderate pectinations (2), but appearing longer on account of the terminal bristles. Thorax and abdomen ochreous grey. Legs whitish, tinged

with reddish, and irrorated with dark fuscous; anterior pair in male fuscous. Forewings triangular, costa straight except close to base and apex, apex pointed, termen slightly rounded, slightly oblique; purplish- reddish- or ochreous-grey, with a few scattered, dark fuscous scales; a straight line from one-quarter costa to one-quarter dorsum, pale fuscous, sometimes edged anteriorly with pale ochreous, sometimes obsolete, or represented by two or three dark fuscous dots; a faint linear discal dot sometimes obsolete; a line similar to first from three-quarters costa to two-thirds dorsum, slightly bent in middle, sometimes represented by a series of dots; cilia concolorous. Hindwings with termen rounded; colour and markings as forewings, but without basal line and discal dot.

Type in Coll., *Turner.*

N.Q., Townsville; in July (Dodd). Q., Brisbane, Dalby. Seven specimens.

Genus, Systatica, nov.

(*Systatikos*, connecting.)

Face smooth. Tongue well developed. Palpi ascending, reaching vertex, densely haired, terminal joint concealed. Antennæ in male with a single row of pectinations on outer side, apical one-sixth simple. Legs smooth, posterior and middle tarsi with a few spinules. Forewings with 7, 8, 9 stalked, 10, 11 stalked, 10 closely approximated to 9, but not connected, 12 free. Hindwings with 6 and 7 separate.

Type *S. xanthastis.* This genus forms a connecting link between *Epidesmia* and *Monoctenia.*

Systatica xanthastis.

Monoctenia (?) xanthastis, Low., Tr.R.S.S.A., 1894, p. 85.

Q., Gympie, Mount Tambourine; in March. Two specimens.

Genus, Homospora, nov.

(*Homosporos*, of the same ancestry.)

Face with strong, obtuse, conical chitinous projection. Tongue well developed. Antennæ in male bipectinated to apex. Palpi moderate, subascending; terminal joint very short. Thorax stout, densely rough-haired beneath. Legs without tarsal spines; anterior tibiæ densely tufted with long hairs beneath; posterior tibiæ without middle spurs. Forewings with 3 and 4 from angle of cell, 6 from upper angle, 7, 8, 9 stalked, 10 connected by a bar with 8 and 9 beyond 7, 11 free. Hindwings with 5 from above middle of cell, 6 and 7 connate.

Allied to *Arrhodia*, Gn., from which it differs in the frontal projection, absence of hook on anterior tibiæ, and connection of vein 10 of forewings with 8 and 9.

HOMOSPORA PROCRITA, n. sp.

(*Procritos*, preferred, esteemed.)

Male, 42 mm. Head and palpi whitish. Antennæ whitish; pectinations in male ochreous, long (5). Thorax grey-whitish, anteriorly whitish-ochreous. Abdomen [broken]. Legs whitish; on upper surface fuscous irrorated, and tarsi annulated, with whitish. Forewings elongate-triangular, costa nearly straight, apex rounded, termen nearly straight, oblique; grey ochreous-whitish, with scattered fuscous scales, which in places tend to form transverse strigulæ; an interrupted fuscous line along basal fourth of costa; a triangular fuscous spot on one-quarter costa, from which proceeds a fine, deeply-waved line to one-quarter dorsum; a straight, broad fuscous transverse shade just beyond middle, a finely dentate, nearly straight, fuscous line from three-quarters costa to three-quarters dorsum; cilia whitish, broadly barred with dark fuscous on middle part of termen. Hindwings with termen rounded; whitish, towards apex washed with pale reddish-purple; a fuscous apical blotch; some fuscous scales towards tornus and about mid-disc; traces of a dentate fuscous postmedian line; cilia whitish, towards apex barred with fuscous.

Type in Coll., *Turner.*

N.Q., Townsville; in March. One specimen received from Mr. F. P. Dodd, in good condition, except abdomen.

Sub-Family, SELIDOSEMINÆ.

ECTROPIS HEMIPROSOPA, n. sp.

(*Hemiprosopos*, half-faced, half-masked.)

Male, female, 32-40 mm. Head grey-whitish; face with a broad median transverse dark fuscous bar. Palpi grey-whitish, external surface fuscous. Antennæ grey-whitish, apices and pectinations darker; in male with very long pectinations (8), apical third simple; most of the pectinations are forked at extremity, many are double from point of origin, and towards apex a few may be simple throughout; in female simple. Thorax whitish-grey. Abdomen whitish-grey, with some fuscous scales and a double series of dorsal fuscous dots. Legs whitish; anterior pair fuscous. Forewings elongate-triangular, costa moderately arched, apex round-pointed, termen nearly straight, more rounded in female, oblique; whitish-grey or whitish in female, finely irrorated with fuscous; dark fuscous dots on costa at one-third, one-half, and two-thirds; a fine dentate outwardly angled line from first costal dot to one-third dorsum, usually obsolete; a dot in disc beneath second costal dot; an interrupted line of more or less

discrete, dark fuscous dots from third costal dot to three-fifths dorsum, slightly outwardly curved above; a series of sub-marginal dots usually incomplete; a series of black, terminal dots; cilia whitish. Hindwings with termen rounded, more or less dentate; colour and markings as forewings, but with discal dot annular, pale centred.

This species appears to be most allied to *E. camelaria*, Gn., but the antennal structure is peculiar, and apparently intermediate between *Ectropis* and *Selidosema*.

Type in Coll., *Turner*.

N.Q., Geraldton, Townsville; in April and May. Q., Brisbane; in March and April. Seven specimens.

Selidosema symmorpha, n. sp.

(*Symmorphos*, of similar appearance.)

Male, female, 27-31 mm. Head whitish; face with a transverse fuscous bar below middle, leaving lower edge narrowly whitish. Palpi moderate ($1\frac{1}{4}$); pale fuscous. Antennæ grey, towards base whitish; in male with very long pectinations (10), apical fifth simple; in female simple. Thorax whitish. Abdomen whitish, with two transverse fuscous lines before middle. Legs grey annulated with whitish; posterior pair whitish. Forewings elongate-triangular, costa slightly arched, apex round-pointed, termen rounded, strongly oblique; 10 and 11 stalked or 11 absent; whitish, markings fuscous; costa with minute strigulæ and larger dots at one-third and beyond middle; a very fine line from first dot forming a prominent angle outwards beneath costa, then inwardly oblique to one-quarter dorsum; a discal dot beneath mid-costa; a fine interrupted wavy line from three-quarters costa to three-fifths dorsum; a faint, dentate, wavy, subterminal line, preceded by fuscous suffusion, a terminal series of black dots; cilia whitish. Hindwings with termen rounded, slightly crenate; colour and markings as forewings.

Extremely similar to *S. cognata*, Wlk.; the female may be readily distinguished by the simple antennæ, the male by the more broadly whitish forehead and slightly longer palpi.

Type in Coll., *Turner*.

N.Q., Townsville; in February. Three specimens received from Mr. F. P. Dodd. Q., Brisbane; one female, in February.

Selidosema leucodesma, n. sp.

(*Leucodesmos*, with white chain or rosary.)

Female, 36 mm. Head, palpi, and antennæ fuscous-brown; antennæ in female simple. Thorax fuscous-brown, with a dark fuscous bar across patagia. Abdomen fuscous-

brown. Legs dark fuscous, irrorated and tarsi annulated with whitish; posterior pair mostly whitish. Forewings elongate-triangular, costa straight except close to base and apex, apex rounded, termen crenulate, bowed, oblique; vein 10 free, 11 absent: fuscous-brown, irrorated with dark fuscous; a fine, dark fuscous line from one-third costa to one-third dorsum, giving off near dorsum an oblique streak towards base of dorsum; a slightly darker median shade; an interrupted dark fuscous line from two-thirds costa, bent inwards in disc, and again bent to end in mid-dorsum; a conspicuous, dentate, interrupted, white, subterminal line; a fine, blackish, terminal line; cilia brownish. Hindwings with termen markedly dentate, rounded; colour and markings as forewings, but basal line and median shade absent. Under side whitish, with large, circular, fuscous, discal spot and terminal fuscous suffusion on each wing, with a whitish, apical spot on forewing.

Type in Coll., *Turner*.

N.Q., Kuranda; in February. One specimen received from Mr. F. P. Dodd.

SCIOGLYPTIS EMMELODES, n. sp.

(*Emmelodes*, elegant, harmonious.)

Male, 39 mm. Head ochreous-whitish; lower half of face irrorated with fuscous; face with a small, acute, anterior projection on lower edge. Palpi moderate ($1\frac{1}{2}$); ochreous-whitish, towards apex irrorated with fuscous. Antennæ pale grey; in male with moderately long pectinations (6), anterior one-fifth simple. Thorax with a slight posterior crest; ochreous - whitish; abdomen ochreous - whitish, anteriorly with a few dark fuscous scales. Legs whitish, irrorated with dark fuscous; anterior tibiæ in male with a tuft of hairs on posterior surface; posterior tibiæ in male somewhat dilated. Forewings triangular, costa nearly straight, apex rounded, termen bowed, oblique; fovea in male large; 10 and 11 stalked, 11 anastomosing with 12; ochreous-whitish; costa strigulated with fuscous; a fine, fuscous line from one-quarter costa to one-sixth dorsum, best marked near dorsum; a nearly straight fuscous line from one-third costa to one-third dorsum, followed by a broadly diffused brownish shade; a dark fuscous discal dot beneath mid-costa; a three times angulated whitish line from three-quarters costa to mid-dorsum, edged with fuscous, very incompletely on anterior aspect, better on posterior, above middle of disc posterior edge is thickened, and followed by a brownish line; a dentate whitish subterminal line; posterior part of disc suffused with pale brownish

and minutely but sparsely strigulated with fuscous; a terminal series of dark fuscous dots; cilia whitish. Hindwings with termen rounded; whitish; a dark fuscous median discal dot; terminal and dorsal areas suffused with pale brownish and strigulated with fuscous; an interrupted, dark fuscous, terminal line; cilia whitish. Under surface ochreous-whitish, with dark fuscous discal dots and fuscous subapical suffusions.

Type in Coll., *Turner*.

Q., Wynnum, near Brisbane; in August. One specimen.

Genus, Pleurolopha, nov.

(*Pleurolophos*, side-crested.)

Face smooth. Tongue well developed. Palpi moderate, obliquely ascending. Antennæ in male simple, moderately ciliated in tufts. Thorax smooth. Abdomen with four pairs of hair-crests, one on each side of fifth, sixth, seventh, and eighth segments, those on sixth and seventh largest. Fore tibiæ in male with a small tuft of hairs from middle of posterior surface. Forewings in male with large fovea; vein 10 free, 11 stalked or absent. Hindwings normal.

This genus belongs to the *Selidosema* section of the subfamily, and is characterised by the curious abdominal side-crests.

Pleurolopha nebridota, n. sp.

(*Nebridotos*, fawn-coloured.)

Male, 36 mm. Head, palpi, thorax, and abdomen brown. Antennæ brownish; ciliations in male, 1½. Legs pale ochreous; anterior pair brownish. Forewings elongate-triangular, costa nearly straight, apex rounded, termen crenulate, bowed, oblique; 11 absent; reddish-brown; costa strigulated with pale fuscous; traces of an inwardly oblique line from one-third costa to one-sixth dorsum; an interrupted, dark fuscous line from two-thirds costa to mid-dorsum; an ill-defined, pale, subterminal line; a terminal series of dark fuscous dots; cilia brown. Hindwings with termen dentate, rounded; colour and markings as forewings. Under side without markings.

Type in Coll., *Turner*.

Q., Brisbane. One specimen.

Genus, Orsonoba.

Orsonoba, Wlk., Brit. Mus. Cat. xx., p. 218.
Hmps., Moths Ind. iii., p. 211.

Sir George Hampson makes this synonymic with *Gonodontis*, Hb., which I should have adopted as the older name, but that I have some doubt as to whether it is congeneric; it is

certainly nearly allied. *Proboloptera*, Meyr. (P.L.S. N.S.W., 1891, p. 641), is also closely allied, if really distinct.

Orsonoba clelia.

Orsonoba clelia, Cram., Pap. Exot., iii., p. 172, pl. cclxxxviii., b. c. Hmps., Moths Ind., iii., p. 212.

Q., Gympie (Illidge). Also from Borneo, Ceylon, and India.

Orsonoba zapluta, n. sp.

(*Zaploutos*, rich.)

Female, 54-56 mm. Head and palpi grey, purplish-grey, or reddish-grey; face with a pair of lateral, whitish spots. Antennæ grey. Thorax and abdomen stout; grey, sometimes reddish tinged. Legs grey, irrorated with dark fuscous. Forewings elongate-triangular, costa straight to near apex, then strongly curved, apex rounded, termen with three slight, subapical dentations, then sigmoid, and with a rounded projection on tornus, dorsum convex in basal and strongly concave in terminal half; grey, whitish-grey, or reddish; a fuscous line from two-fifths costa, shortly outwardly oblique, then strongly bent inwards to one-third dorsum; a similar line from three-quarters costa to three-quarters dorsum, preceded beneath angle by a ferruginous suffusion, which sometimes contains hyaline spots free from scales; a short ferruginous shade from costa before apex, and a slight similar shade from tornus; cilia grey or reddish. Hindwings with costa strongly excavated in middle, short, no true apical angle, but a strongly projecting acute angle on vein 7, termen obtusely angled on vein 4, straight above and below angulation; colour as forewings; a small, hyaline, scale-less spot, bordered with fuscous on end of cell; a transverse, fuscous, or ferruginous line just beyond discal spot, sometimes succeeded by some hyaline spots resembling those on forewing.

A variable species, but easily recognised; the hyaline discal spot of hindwings is a good characteristic.

Type in Coll., *Turner*.

Q., Brisbane; in April and May. Three specimens.

Orsonoba luteola, n. sp.

(*Luteolus*, yellowish.)

Male, 37 mm. Head ochreous; face with rounded projection, with a median pair of fuscous dots, beneath which is a brownish, transverse bar, lower edge whitish. Palpi ochreous, apex fuscous. Antennæ fuscous; in male bipectinated to apex, pectinations moderately long (4). Thorax whitish, anterior edge broadly fuscous. Abdomen whitish-ochreous

with a few scattered, dark fuscous scales. Legs whitish-ochreous, irrorated with dark fuscous. Forewings elongate-triangular, costa straight to near apex, apex rounded, termen anterior edge broadly fuscous. Abdomen whitish-ochreous, broad, fuscous streak on costa to one-third; costa thence strigulated with fuscous, with a larger spot at two-thirds; a fine, inwardly oblique, dark fuscous line from beneath one-third costa to one-quarter dorsum; two very short, outwardly oblique lines from mid-dorsum; a dark fuscous collection of strigulæ beneath apex, in which is a subapical, white spot; some similar strigulæ above tornus; cilia whitish ochreous, near apex fuscous. Hindwings with costa nearly straight, no true apex, an acute projecting angle on vein 7, and a stronger angle on vein 4; termen wavy between angles, but straight between second angle and tornus; colour as fore-wings, but lines obsolete. Underside with three, strong, oblique lines on forewings at about one-third, middle, and two-thirds; two angulated lines on hindwing not reaching dorsum.

Type in Coll., *Turner*.

Q., Brisbane; in September. One specimen.

ORSONOBA LEUCOPREPES, n. sp.

(*Leucoprepes*, with conspicuous whiteness.)

Male, 34 mm. Head grey, mixed with white; face with a strong, rounded, conical protuberance, grey, margins white. Palpi grey. Antennæ ochreous-whitish; in male bipectinated to apex, pectinations moderately long (5). Thorax grey. Abdomen grey, with a few dark fuscous scales. Legs pale grey. Forewings elongate-triangular, costa straight, apex rounded, termen bowed, oblique; grey; costa strigulated with dark fuscous; an interrupted fuscous line from five-sixths costa to three-fifths dorsum; preceded by two wedge-shaped, white blotches between veins 2 and 4, separated by vein 3, which is narrowly grey; some suffused, dark fuscous spots on costal half of termen; cilia grey. Hindwings with costa straight, no true apex, a slightly prominent angle on vein 7, and another better marked on vein 4, termen wavy between angles, straight between second angle and tornus; colour and markings as forewings, but with a single, rather irregular, white blotch towards dorsum.

The strongly projecting forehead is an exaggeration of the less-marked prominence in *luteola* and *clelia*.

Type in Coll., *Turner*.

Q., Dalby. One specimen.

Genus, Callipona, nov.

(*Calliponos*, beautifully wrought.)

Face smooth, with a small, projecting tuft of hairs at lower extremity. Tongue well developed. Palpi porrect, rather long (2¼); second joint covered with densely appressed hairs; terminal joint about one-fifth second; down-curved, smooth-scaled, tolerably pointed. Antennæ in male bipectinated, terminal fifth simple. Forewings in male with a small fovea; veins 7, 8, 9, 10 stalked. Hindwings with cell very short (⅙).

Perhaps allied to *Xenographia*, Warr. (P.Z.S., 1893, p. 404; Hmps., Moths Ind., iii., p. 189). The very short cell of hindwings is a noteworthy characteristic.

Callipona metabolis, n. sp.

(*Metabolis*, variable.)

Male, female, 32-38 mm. Head and palpi greenish or reddish. Antennæ whitish, sometimes reddish, tinged; in male with rather long (6), fuscous dentations. Thorax and abdomen greenish or reddish. Legs fuscous or reddish, with white irroration. Forewings triangular, costa straight, gently arched towards base and apex, apex pointed, termen strongly bowed, slightly oblique; greenish, greenish-grey, reddish-grey, orange-reddish, or purplish-reddish; lines darker and varying with ground colour; a transverse line from one-sixth costa to one-sixth dorsum, sometimes scarcely traceable; a slightly curved line from mid-costa to mid-dorsum; a third line from three-quarters costa, more strongly outwardly curved to three-quarters dorsum, sometimes obsolete; sometimes a few generally scattered fuscous scales; cilia concolorous. Hindwings with costa strongly rounded, termen rounded; colour as forewings; median and postmedian lines as forewings; a more or less developed dark fuscous spot or blotch on postmedian line near costa. Under side yellowish-green or reddish, finely strigulated with fuscous, costal edge of forewing white, a triangular subapical white blotch on termen of forewing, also strigulated.

Very variable in colour, but otherwise constant, and easily recognised.

Type in Coll., *Turner*.

N.Q., Townsville; in July and August. Nine bred specimens received from Mr. F. P. Dodd.

Deilinia acrocosma, n. sp.

(*Acrocosmos*, with apical ornament.)

Male, 35 mm. Head fuscous-grey. Palpi pale ochreous. Antennæ fuscous-grey; in male with long pectinations (10),

apical eighth simple. Thorax and abdomen brownish. Legs brown-whitish; anterior and middle pairs fuscous anteriorly; anterior tibiæ in male with a tuft of long hairs from base on posterior surface. Forewings triangular, costa slightly arched, apex rounded, termen bowed, oblique; 7, 8, 9, 10 stalked, 11 free; in male without fovea; dull brownish; costa fuscous, with whitish irroration; three fine wavy, slightly darker brown, transverse lines at one-quarter, before middle, and at two-thirds; a dark fuscous discal dot beneath mid-costa, edged with pale scales; an oval whitish apical blotch containing some brownish scales; a terminal series of minute dark fuscous dots; cilia brownish. Hindwings with termen rounded; colour as forewings; a minute, whitish, discal dot; an interrupted dentate, whitish, subterminal line; cilia as forewings.

Type in Coll., *Turner*.

Q., Stradbroke Island; in April. One specimen.

DEILINIA CATHARODES, n. sp.

(*Catharodes*, neat-looking.)

Female, 36 mm. Head, palpi, antennæ, thorax, and abdomen, whitish-brown. Legs pale fuscous; posterior pair whitish. Forewings elongate-triangular, costa moderately arched, apex tolerably pointed, termen slightly bowed, oblique; 7, 8, 9, 10 stalked, 11 arising separately and anastomosing with 12; whitish-brown, with a few scattered fuscous scales, in places tending to form strigulæ; a faintly darker slightly curved transverse line at one-fifth; a dark fuscous discal dot at two-fifths; succeeded by a rather broad, brownish line from mid-costa to mid-termen; a similar but finer line from three-fifths costa to three-quarters termen; a sub-terminal series of dark fuscous dots on veins; a terminal series of dark fuscous dots between veins; cilia whitish-brown. Hindwings with termen slightly rounded, dentate; colour and markings as forewings.

Recalling some of the *Sterrhinæ* in superficial appearance.

Type in Coll., *Turner*.

T., Hobart. One specimen.

GASTRINA CATASTICTA, n. sp.

(*Catastiktos*, speckled.)

Female, 37 mm. Head white, with a median fuscous dot; face dark fuscous, margins narrowly white. Palpi moderate ($1\frac{1}{4}$); white; second joint with median and subapical dark fuscous rings. Antennæ fuscous. Thorax white, spotted with dark fuscous. Abdomen ochreous-whitish, with a fuscous spot on dorsum of each segment; crests anteriorly white.

Forewings elongate-triangular, costa moderately arched, apex rounded, termen bowed, slightly oblique; 10 arising from cell, connected with 8 and 9, beyond 7, 11 free; white, speckled with dark fuscous; veins partly slenderly outlined with ochreous; markings dark fuscous: a transverse basal line; a dentate line from one-fifth costa to one-quarter dorsum, thickened on costa; a somewhat dentate line from costa before middle to mid-dorsum; a short, linear, transverse discal spot just beyond this; a broad, subterminal line broadly interrupted in disc; a submarginal spot above middle; a terminal series of blackish wedge-shaped spots; cilia white, interrupted by fuscous opposite veins. Hindwings with termen rounded; grey, paler towards base; two white lines from tornus, lost in disc; cilia as forewings.

Differing from the type species slightly in neuration, but agreeing in other respects.

Type in Coll., *Turner.*

Q., Mount Tambourine; in November. One specimen. There is another from the same locality in Coll., *Illidge.*

Genus, Cryptoscopa, nov.

(*Cryptoscopos*, hidden, inconspicuous.)

Face flat. Tongue well developed. Palpi short, not projecting beyond frons; second joint densely rough scaled, terminal joint concealed. Antennæ in male simple, with extremely short ciliations ($\frac{1}{4}$). Thorax with a slight posterior crest. Posterior tibiæ of male somewhat dilated, with a tuft of hairs from inner side of base, middle spurs well developed, terminal spurs very short. Forewings in male with a large, oval, shallow fovea near base; 10 and 11 stalked, 10 anastomosing with 9. Hindwings normal.

Cryptoscopa aprepes, n. sp.

(*Aprepes*, unadorned, inconspicuous.)

Male, female, 22-28 mm. Head, palpi, antennæ, thorax, and abdomen dark fuscous. Legs dark fuscous, irrorated, and tarsi annulated with whitish. Forewings triangular; costa straight, slightly arched towards apex, apex rounded, termen slightly bowed, slightly oblique; dark fuscous; two fine, transverse, slightly outwardly curved, blackish lines, first from one-third costa to one-third dorsum, second from beyond mid-costa to beyond mid-dorsum; cilia fuscous. Hindwings with termen rounded; fuscous, towards base paler; a darker transverse line from tornus nearly to costa; cilia fuscous.

Type in Coll., *Turner.*

N.Q., Geraldton; in May. Q., Brisbane; in February. Three specimens.

Family, LASIOCAMPIDÆ.

The following five genera, which are closely allied, may be distinguished as follows:—

A. Forewings with 6, 7, and 8 stalked.
Pinara, Wlk., iii., p. 761. Type, *cana*, Wlk.
AA. Forewings with 8 separate.
B. Palpi long, over 3 times breadth of eye.
C. Hindwings with 4 and 5 stalked.
Entometa, Wlk., iv. p. 972. Type, *marginata*, Wlk.
CC. Hindwings with 4 and 5 separate.
Opsirhina, Wlk., vi., p. 1418. Type, *albigutta*, Wlk.
BB. Palpi moderate, not more than twice the breadth of eye.
C. Hindwings with 4 and 5 stalked.
Symphyta, Turn., Tr.R.S.S.A., 1902, p. 187. Type, *psaropis*, Turn.
CC. Hindwings with 4 and 5 separate.
Clathe, Wlk., v., p. 994. Type, *arida*, Wlk.

In all these genera vein 7 of the hindwings arises from near the base of cell, and almost immediately anastomoses very shortly with vein 8; in this they differ from the genera, of which *Odonestis*, Germar, is a representative.

ENTOMETA SPODOPA, n. sp.

(*Spodopos*, ashen.)

Male, 40 mm. Head, thorax, palpi, antennæ, abdomen, and legs whitish-grey, slightly ochreous tinged. Forewings triangular, costa nearly straight, apex rounded, termen strongly bowed, scarcely oblique; whitish-grey, slightly ochreous tinged; markings pale fuscous; a discal dot before middle; a fine, slightly dentate line from two-thirds costa to mid-dorsum; a less distinct but broader and interrupted line from apex to before tornus; cilia pale fuscous, slightly reddish tinged. Hindwings with termen strongly rounded; vein 3 connate or short stalked; pale grey, slightly darker than forewings; cilia whitish-grey.

Type in Coll., *Turner*.

Q., Brisbane; in May. Two specimens.

ENTOMETA PLINTHOPA.

(*Plinthopos*, brick-coloured.)

Male, 36 mm. Head, thorax, palpi, antennæ, abdomen, and legs pale reddish-ochreous. Forewings triangular, costa straight, gently arched towards apex, apex rounded, termen straight, scarcely oblique; pale reddish-ochreous: markings fuscous; a line from one-quarter costa to one-quarter dorsum; a discal dot at one-third; a faintly marked line from mid-costa, at first outwardly curved, then strongly inwardly oblique to one-third dorsum; a line from apex to dorsum at two-thirds; cilia [denuded]. Hindwings with termen strongly rounded; vein 3 stalked; pale reddish; a fuscous suffusion on costa; cilia pale reddish.

Type in Coll., *Turner*.

N.Q., Townsville; in July. One specimen received from Mr. F. P. Dodd.

Genus, OPSIRHINA.

Opsirhina, Wlk., Brit. Mus. Cat. vi., p. 1418.

As *fervens*, the first species placed by Walker in this genus, belongs to the previously characterised *Entometa*, I hereby constitute *albigutta* the type.

OPSIRHINA ALBIGUTTA.

Opsirhina albigutta, Wlk., Brit. Mus. Cat. vi., p. 1419.

T., Hobart. One fine, bred specimen received from Mr. A. M. Lea.

SYMPHYTA CYCLOMELA.

Opsirhina cyclomela, Low., Tr.R.S.S.A., 1903, p. 183.

N.Q., Townsville. I have received a fine, bred pair from Mr. F. P. Dodd, who has found the larvæ feeding on *Eucalyptus*, *Careya*, and other trees.

Family, LIMACODIDÆ.

Owing to a mistake of the printer's in mixing the proof sheets, this family has been mixed with the *Xyloryctidæ* in my former paper (Tr. R.S.S.A., 1902). These families are so distinct that any real confusion can hardly arise, but the reader may prevent any such possibility by adding the family heading *Xyloryctidæ* before *Cryptophasa eucephala*, on p. 193, and *Limacodidæ* before *Thosea penthima*, on p. 206.

The following is a tabulation of the Australian genera:—

A. Hindwings with 8 approximated closely to basal half of cell	*Doratifera*, Westw.
AA. Hindwings with 8 not closely approximated to cell as far as middle	
B. Forewings with 10 absent	*Apodecta*, Turn.
BB. Forewings with 10 present	
C. Forewings with 7 separate	
D. Forewings with 8, 9, 10 stalked...	*Birthama*, Wlk.
DD. Forewings with 10 separate ...	*Natada*, Wlk.
CC. Forewings with 7 stalked with 8 and 9	*Momopola*, Meyr.
D. Forewings with 7, 8, 9, 10 stalked	*Tetraphleps*, Hmps.
DD. Forewings with 10 separate	
E. Posterior tibiæ with terminal spurs only	*Parasa*, Moore.
EE. Posterior tibiæ with two pairs of spurs	
F. Palpi moderate	
G. Antennæ of male pectinated to apex	*Thosea*, Wlk.
GG. Antennæ of male simple or serrate towards apex ...	*Susica*, Wlk.
FF. Palpi very long	*Elassoptila*, Turn.

Doratifera unicolor.

Doratifera unicolora (recte unicolor), Swin., A.M.N.H. (7), ix., p. 418 (June, 1902).

Doratifera stenora, Turn., Tr.R.S.S.A., 1902, p. 189.

I think these must be synonymous, though Col. Swinhoe does not mention the pale, apical streak on forewing, and the legs in my examples are brown, not red. His name has several months' priority.

Q., Rockhampton. N.W.A., Roeburne (Swinhoe).

Birthama plagioscia.

(Plagioscios, obliquely shaped.)

Birthama plagioscia, Turn., Tr.R.S.S.A., 1902, p. 190.

Doratiphora aspidophora, Low., Tr.R.S.S.A., 1902, p. 218.

Birthama leucosticta, n. sp.

(Leucostictos, with white spots.)

Male, 22 mm. Head and palpi brown-whitish. Antennæ ochreous-whitish; in male basal two-fifths, with very long pectinations, apical three-fifths simple. Thorax and abdomen brown. Legs brown, tarsi annulated with white; posterior tibiæ with two pairs of spurs. Forewings triangular, costa straight, apex [broken], termen long, rounded, oblique; brown, with fuscous-brown irroration; a minute snow-white median discal dot; indications of a sigmoid, median, fuscous-brown line; a fuscous-brown subterminal line; cilia [worn]. Hindwings with termen rounded; greyish-brown.

Type in Coll., *Turner.*

N.Q., Thursday Island. One specimen.

Birthama dochmographa, n. sp.

(Dochmographos, obliquely marked.)

Female, 30 m. Head reddish-brown, mixed with whitish. Palpi brown, mixed with whitish on upper surface. Antennæ grey. Thorax brown, anteriorly reddish-brown. Abdomen fuscous-brown. Legs brown; tarsi with obscure, whitish annulations. Forewings triangular, costa straight, apex rounded, termen obliquely rounded; fuscous-brown; a triangular patch of dark fuscous and reddish-brown scales on base of dorsum; bounded externally by a fine white line from one-quarter dorsum, slightly angled in mid-disc, and continued nearly to three-quarters costa; from angle this gives off a white line along vein 5 to termen; veins 3 and 4 partly outlined with white; a dark, fuscous-reddish shade from costa, near apex, to vein 5; cilia fuscous. Hindwings with termen rounded; fuscous; cilia fuscous.

Type in Coll., *Turner.*

N.Q., Mulgrave River, near Cairns. One specimen.

NATADA MONOMORPHA, n. sp.
(*Monomorphos*, uniform.)

Female, 40 mm. Head, palpi, thorax, and abdomen pale ochreous. Antennæ whitish-ochreous. Legs brown, tarsi annulated with whitish, coxæ and femora pale ochreous. Forewings triangular, costa gently arched, apex rounded, termen rounded, scarcely oblique; uniform pale ochreous; a slightly darker median discal dot; cilia pale ochreous with a brown median line. Hindwings with termen rounded; brownish, towards costa passing into pale ochreous; cilia pale ochreous, with a brownish line towards tornus.

Type in Coll., *Turner*.

N.Q., Townsville; in February. One specimen bred by Mr. F. P. Dodd, who describes the larva as yellow, oval, with four rows of tufts of bristles.

PARASA LOXOLEUCA, n. sp.
(*Loxoleucos*, obliquely white.)

Female, 36 mm. Head, palpi, thorax, and abdomen brownish. Antennæ whitish-ochreous. Legs brownish-ochreous. Forewings rather elongate-triangular, costa gently arched, apex rounded, termen obliquely rounded; fuscous-brown; a broad, oblique, white fascia from beyond middle of costa to before middle of dorsum, its margins irregularly dentate; a dark fuscous suffusion in mid-disc follows this; a white terminal band, sharply dentate anteriorly along veins, and containing a wavy, fuscous, subterminal line; cilia [worn]. Hindwings with termen rounded; pale brownish-fuscous; cilia concolorous.

The type in Coll., *Turner*, is in poor condition.

N.Q., Townsville; in January. One specimen received from Mr. F. P. Dodd.

PARASA LOXOGRAMMA.

Parasa lozogramma, rect. *loxogramma*, Turn., Tr.R.S.S.A., 1902, p. 193.

PARASA BRACHYOPA.

Doratiphora brachyopa, Low., P.L.S.N.S.W., 1897, p. 10.

THOSEA LIOSARCA.

Doratiphora ? liosarca, Low., Tr.R.S.S.A., 1902, p. 217.

The female antennæ are not pectinated.

N.Q., Thursday Island.

THOSEA BOMBYCOIDES.

Lethocephala bombycoides, Feld., Reise Nov., pl. lxxxiii., f. 14.

Thosea erecta, Swin., A.M.N.H. (7), ix., p. 418 (June, 1902).

Doratiphora amphibrota, Low., Tr.R.S.S.A., 1902, p. 216.

I have received a female example from Col. Swinhoe, which I believe corresponds to Felder's figure and Lower's description.

SUSICA ALPHAEA.

Bombyx alphaea, Fab., Syst. Ent. iii., part i., p. 445.
Eloasa calida, Wlk., Brit. Mus. Cat. xxxii., p. 494.
Lethocephala eremospila, Low., Tr.R.S.S.A., 1902, p. 219, Q., Brisbane.

SUSICA MILTOCOSMA.

Susica miltocosma, Turn., Tr.R.S.S.A., 1902, p. 191.
Momopola cosmocalla, Low., Tr.R.S.S.A., 1902, p. 220.

Family, ZYGAENIDÆ.

Genus, HOMOPHYLOTIS, nov.

(*Homophulos*, of the same stock.)

Face smooth, rounded, somewhat projecting. Palpi moderate, slender, porrect. Antennæ in male with very long pectinations, apical sixth simple; in female thickened except near base and apex. Posterior tibiæ without middle spurs. Forewings with all veins present; 2 from near angle, 7 and 8 stalked. Hindwings with all veins present; 3 and 4 stalked, 6 and 7 separate, 8 connected by a bar with cell about middle.

No doubt a development of Procris, from which it differs in the stalking of 7 and 8 of forewings.

HOMOPHYLOTIS THYRIDOTA, n. sp.

(*Thyridotos*, having a window, in allusion to hindwings.)

Male, female, 12-14 mm. Head and thorax dark fuscous, with a dull purple sheen; face pale fuscous. Palpi whitish-ochreous. Antennæ dark fuscous with a white subapical ring; pectinations in male very long, outer row twice as long as inner. Abdomen dark fuscous. Legs whitish-ochreous; tibiæ and tarsi barred above with fuscous. Forewings elongate-triangular, costa at first straight, rather strongly arched towards apex, apex rounded, termen straight, oblique; dark fuscous, with a dull purple sheen; cilia whitish, bases dark fuscous. Hindwings with termen nearly straight; dark fuscous; an oval central translucent area, almost devoid of scales except on veins; cilia as forewings.

Type in Coll., *Turner*.

N.Q., Kuranda; in February and March. Four specimens received from Mr. F. P. Dodd.

Family, TINEIDÆ.

Sub-Family, XYLORYCTINÆ.

CRYPTOPHASA ALPHITODES, n. sp.

(*Alphitodes*, floury.)

Male, 35 mm.; female, 47 mm. Head and palpi whitish. Antennæ whitish; pectinations in male moderate (5). Thorax whitish, irrorated with grey. Abdomen whitish-ochreous. Legs fuscous, irrorated with whitish-ochreous; posterior pair mostly whitish-ochreous. Forewings elongate-oblong, costa gently arched, more strongly in female; vein 2 from two-thirds; whitish, irrorated with grey; an oblique fuscous bar from base of costa to fold; an oblique oval median discal spot outlined with fuscous scales, centre whitish-ochreous; a few fuscous scales in disc at one-third before this; cilia whitish, on costa barred with fuscous. Hindwings whitish-ochreous; cilia whitish.

Type in Coll., *Turner*.

N.Q., Thursday Island. Two specimens.

CRYPTOPHASA THEMERODES, n. sp.

(*Themerodes*, grave, sombre.)

Female, 35 mm. Head fuscous, mixed with whitish; face white. Palpi whitish. Antennæ fuscous. Thorax fuscous, mixed with whitish. Abdomen grey, apices of segments whitish, preceded by ferruginous. Legs whitish, with fuscous irroration. Forewings elongate-triangular, costa rather strongly arched in female; vein 2 from three-quarters; whitish, intimately mixed with grey, and with some dark fuscous scales; discal dots scantily represented by dark fuscous scales, first at one-third, second beyond middle, third on fold obliquely beyond first; several dark fuscous dots near termen; cilia grey. Hindwings whitish, towards termen suffused with pale fuscous; cilia whitish, with a fuscous line near bases.

Type in Coll., *Turner*.

Q., Stradbroke Island; in November. One specimen.

XYLORYCTA CIRRHODES, n. sp.

(*Cirrhodes*, yellowish, tawny.)

Female, 32 mm. Head brownish-ochreous; face paler. Palpi ochreous-whitish, mixed with fuscous. Antennæ pale fuscous. Thorax brown. Abdomen pale ochreous; with five transverse ferruginous bars. Legs ochreous; anterior and middle pairs somewhat infuscated. Forewings elongate-oblong, costa rather strongly arched in female; whitish-ochreous irrorated with grey; three brownish-ochreous median blotches, first at base, second before, and third after middle; a well-

marked, whitish-ochreous line from two-thirds costa obliquely outwards, bent in disc, forming a rounded elbow, and ending in three-quarters dorsum; terminal part of disc suffused with brownish-ochreous; cilia pale ochreous. Hindwings and cilia ochreous.

Type in Coll., *Turner*.

Q., Goodna, near Brisbane; in October. One specimen.

LICHENAULA CALLISPORA, n. sp.

(*Callisporos*, prettily spotted.)

Male, female, 12-20 mm. Head white. Palpi white; second joint with a basal, third joint with a basal and apical blackish ring. Antennæ blackish; in female white, annulated with blackish; ciliations in male short ($\frac{2}{3}$). Thorax white, with variable blackish spots. Abdomen whitish. Legs whitish; anterior and middle pairs annulated with blackish. Forewings narrow-elongate, costa nearly straight; white, with blackish spots; a row of two or three spots close to base; two to four spots on costa; a variable number of spots in disc and on dorsum; these may be partly confluent with each other and with costal spots; a terminal series of spots; cilia white, with a blackish bar at apex. Hindwings with termen rounded; whitish grey; cilia whitish.

Type in Coll., *Turner*.

V., Birchip. Three specimens, received from Mr. D. Goudie.

PROCOMETIS APLEGIOPA, n. sp.

(*Aplegios*, plain, simple.)

Male, female, 15-19 mm. Head ochreous. Palpi with terminal joint two-thirds second; pale fuscous, internal surface whitish. Antennæ fuscous. Thorax pale ochreous, with a large, central, fuscous suffusion. Abdomen ochreous-whitish or grey. Legs pale fuscous; posterior pair, except tarsi, ochreous-whitish. Forewings elongate, costa gently arched, apex acute, termen very oblique; pale ochreous, sometimes suffused with fuscous, especially towards dorsum; cilia concolorous. Hindwings with termen sigmoid; grey; cilia grey.

Type in Coll., *Turner*.

Q., Stradbroke Island; in January. Three specimens.

Family, HEPIALIDÆ.

Genus, FRAUS.

Fraüs, Wlk., Brit. Mus. Cat. vii., p. 1564.

Hectomanes, Meyr., P.L.S.N.S.W., 1889, p. 1125.

Without denying the probability of Mr. Meyrick's explanation of the origin of this name, I think it is best to treat it as one of Walker's nonsense-names.

FRAUS CROCEA.

Hectomanes crocea, Luc., P.L.S.N.S.W., 1891, p. 283.

The female has the forewings proportionately narrower than in the male, and of a pale brownish colour, the hindwings being grey-whitish. Dr. Lucas has described a variety of the male as female.

Q., Brisbane, Toowoomba; in March, April, and May. N.S.W., Sydney.

FRAUS SIMULANS.

Fraüs simulans, Wlk., Brit. Mus. Cat. vii., p. 1564.

Hectomanes simulans, Meyr., P.L.S.N.S.W., 1889, p. 1126. Male, nec., female.

Hectomanes fusca, Luc., P.L.S.N.S.W., 1891, p. 283.

Female specimens received from Mr. G. Lyell have the forewings uniformly fuscous without any trace of a white streak.

I have not seen Dr. Lucas's type, but do not think it is likely to be distinct.

V., Moe, Gisborne. T., Hobart.

FRAUS BILINEATA.

Fraüs bilineata, Wlk., Brit. Mus. Cat. xxxii., p. 595.

I think Mr. Meyrick has been mistaken in describing this as the female of the preceding species I have male examples with markings exactly similar to the female.

V., Melbourne. W.A., Coolgardie.

HEPIALUS SPLENDENS.

Charagia splendens, Scott, Tr.E.S.N.S.W., ii., p. 31.

Q., Brisbane. N.S.W., Sydney.

HEPIALUS SCOTTI.

Charagia scotti, Scott, Tr.E.S.N.S.W., ii., p. 34.

Hepialus daphnandræ, Luc., P.L.S.N.S.W., 1891, p. 284.

N.Q. (Dodd). Q., Nambour, Brisbane, Mount Tambourine. N.S.W., Richmond River.

HEPIALUS RAMSAYI.

Charagia ramsayi, Scott, Tr.E.S.N.S.W., ii., p. 32.

Q., Nambour, Brisbane, Mount Tambourine. N.S.W., Newcastle.

HEPIALUS EXIMIUS.

Charagia eximia, Scott, Tr.E.S.N.S.W., ii., p. 35.

Q., Nambour, Mount Tambourine. N.S.W., Newcastle.

Hepialus mirabilis.

Charagia mirabilis, Roths.

N.Q. I have received a fine pair of this truly magnificent species from Mr. F. P. Dodd.

Hepialus cyanochlorus.

Hepialus thermistis, Low., Tr.R.S.S.A., 1894, p. 77 (var. female).

Hepialus cyanochlora, Low., Tr.R.S.S.A., 1894, p. 77.

The male resembles *H. eximia*, male, but has the base of abdomen and of hindwings reddish. The female is normally bright grass green, and similarly marked to *H. scotti*, female, but has the hindwings uniformly red.

Var. female *thermistis*. Differs from the typical form only in the ground colour of the forewings being brown.

N.Q., Townsville (Dodd), Mackay.

Pielus aphenges, n. sp.

(*Aphenges*, dark, gloomy.)

Female, 64 mm. Head, palpi, thorax, abdomen, and legs fuscous. Antennæ ochreous-fuscous. Forewings elongate-oval, costa straight, towards apex slightly arched, apex rounded, termen and dorsum continuously rounded · fuscous, with numerous whitish lunules and short streaks; cilia fuscous. Hindwings and cilia grey.

Type in Coll., *Turner*.

N.S.W., Sydney. One specimen received from Mr. G. R. Waterhouse.

Trictena labyrinthica.

Cossus labyrinthicus, Don., Ins. N. Holl.

Q., Brisbane. N.S.W., Sydney. T., Mount Wellington. W.A., Cooigardie.

Note on Tertiary Exposures in the Happy Valley District, with Description of a New Species of Septifer.

By Herbert Basedow.

[Read October 4, 1904.]

Plates XXXV. and XXXVI.

The district which forms the subject of the present note is situated about eight miles south of Adelaide, adjacent to the main South Road and the Happy Valley Reservoir. Mr. H. Y. L. Brown, the Government Geologist, has outlined the geological features of the district, and the late Professor Ralph Tate placed in the Geological Museum of the South Australian School of Mines a number of tertiary fossils which were obtained during the construction of the Happy Valley Reservoir. The names of these species appear in the catalogue of tertiary fossils in the Museum of the School of Mines, compiled by Mr. G. B. Pritchard, and published in the Annual Report for 1891. The bed-rock—within a valley of which the tertiary beds were deposited—consists of coarse, arenaceous, more or less decomposed, clay slates, in parts spangled with tiny flakes of mica (secondary?). The beds vary in colour through yellow, brown, blue, and chocolate, and are highly ferruginous.

Tertiary.—*Eocene.* The deposits of this age are chiefly exposed in cuttings, and vary from a compact, greenish, chalcedonised sandstone, with fossils wholly converted into chalcedony, through a more friable, decomposed, white, "chalky" matrix (also fossiliferous), to a glauconitic, iron-shot sandstone, with casts and impressions of shells preserved in glauconite and limonite. A complete pseudomorphous replacement of the molecules of the original calcium-carbonate by chalcedony, glauconite, and limonite is thus exemplified in one and the same bed. The most inland exposure known in this district was passed through during the excavation of the contour-channel around the Happy Valley Reservoir, which intercepts the surface drainage. Fossils found at this spot are mostly pseudomorphs in chalcedony, the specific identifications of which are in many cases quite impossible

The following are the most characteristic species observed: —

Nautilus sp. (as at Aldinga)
Voluta sp.
Fusus simulans, Tate (?)
Turritella aldingæ, Tate
Trivia sp.
Pecten eyrei, Tate
P. flindersi, Tate
P. hochstetteri, Zittel
Modiola sp.
Leda sp.
Lucina sp.
Cardium moniletectum, Tate
Chione multitaeniata, Tate
C. sp.
Magellania pectoralis, Tate
Schizaster abductus, Tate
Macropneustes decipens, Tate

This chalcedonic deposit weathers to a more or less powdery, whitish mass. A similar deposit occurs in a well section and on ploughed land on a property situated about a quarter-mile from the main road in Maclaren Vale. In this locality *Turritella aldingæ* is a conspicuous form.

In an excavation on the Vale Royal Vineyards a bed of richly fossiliferous, glauconitic sandstone was passed through, and it is capped by a hard band of ironstone cement. The height of the tertiary beds at the Vale Royal Cellars is, roughly, 450 feet above low-water mark at the present day. South of Aldinga the beds, which are unmistakably identical and continuous with the Happy Valley exposures, are at water-level. The question arises whether this difference in altitude can be attributed to the gradual upheaval of the beds, or to a fault ; but the former assumption appears the more likely. The fossils which I gathered at this excavation are in a better condition than in either of the former instances, and appear principally as pseudomorphs in glauconite and limonite. The species are: —

Turritella aldingæ, Tate
Calyptraea placuna, Tate
Lima bassii, T. Wds.
Limatula jeffreysiana, Tate
Pecten eyrei, Tate
P. sp.
P. flindersi, Tate
Septifer subfenestratus, sp. nov.
Cardita latissima, Tate
Cardium victoriæ, Tate
Chione cainozoica, T. Wds.
Protocardium hemimeris, Tate
Tellina, sp.
Myadora, sp.
Humphreyia teredina, Tate
Magellania pectoralis, Tate
M. insolita, Tate
M. tateana, Tate
Magasella, sp.
Dentalium subfissura, Tate
Amphihelia striata, T. Wds.

Miocene.—Under this heading I have classed an extensive sandstone formation, which, to all appearances, conformably overlies the true Eocene. Its physical features are

recognisable — even where denudation has covered it with soil and sand—by level, disconnected tracts of land ending abruptly on one or more sides in a scarped face and a talus slope abutting against the base. Characteristic vegetation growing on the surface of the formation is *Banksia* and *Casuarina*. The sandstone, composed essentially of rounded to subangular grains and pebbles of quartz, varying in size from submicroscopic dimensions to one or two inches in diameter, is cemented by protoxide of iron. A local leaching out and reprecipitation of the iron oxide has produced masses consisting of uncemented sand-grains (the so-called "quicksands" of the quarrymen) in the one case; and a variegated aspect of the rock in the other. In certain parts of the country large surface deposits of loose sand have thus been produced from the sandstone. Small accessory crystals of fluorite and "pockets" of glauconite are distributed through the rock. The formation shows no definite planes of stratification, but here and there a distinct "current" or "false bedding" is visible. Fossils have so far been found only at one spot in the upper sandstone: at a point some hundred yards west of the reservoir, in the exit channel of the by-wash; but they are too imperfect for specific or even generic determination. In the upper zone of the sandstone, however, occur hard, siliceous, cylindrical masses, having the appearance of fossilised roots and stems of plants. If such, an exact determination might have thrown some light upon the somewhat doubtful age of the sandstone. Professor H. Graf zu Solms-Laubach kindly undertook the determination of the "roots" for me. After preparing the necessary micro-sections, the Professor came to the following conclusion, which I give in his own words:—"Die cylindrischen Exemplare scheinen aus verschiedenen zusammengebackenen Wurzeln oder Stengeln nach Art von Japorta's *Schizocaulon* zu bestehen. Da sie indessen gar keine Strustur bieten, so kann ich leider nicht einmal sicher sagen ob sie pflanzlichen Ursprungs sind. Für die Bestimmung der Formation aus der sie stammen geben allerdings diese Fossilreste gar keinen Anhalt." In a subsequent note he continues:— . . . "wenn es aber dergleichen *(Schizocaulon)* sein sollte, so kann es immerhin ebensogut aus miocenen oder eocenen Ablagerungen stammen."

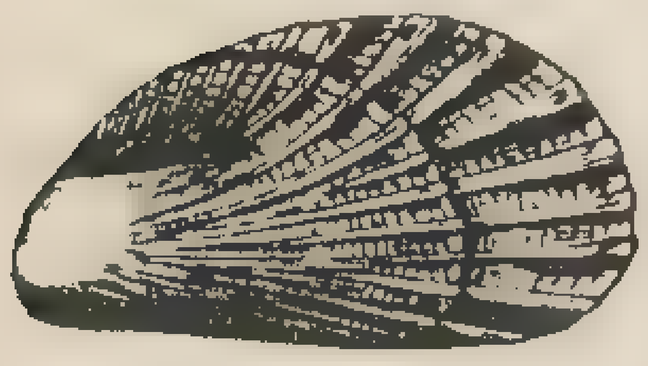
From these statements it is clear that no definite results can be drawn from the examination of the "roots." In the first place, it is still doubtful whether they are of vegetable origin; secondly, the generic identification is uncertain; and lastly, if the identification be correct, there remains the choice between Eocene and Miocene for the age of the formation, as *Schizocaulon* may occur in either epoch.

The presence of large quantities of glauconite is of interest. Appearing, as it does, as "pockets" of over a foot in thickness, it would, at first sight, suggest a contemporaneous deposition with the sandstone. Deposits of glauconite are at the present day usually found at depths of from 700 to 800 fathoms.* The fact, moreover, that the fossil casts of shells are pseudomorphs in glauconite further indicates a transportation and infiltratory redistribution of the mineral, probably in a state of suspension in percolating water as an exceedingly fine powder, capable of passing with the water through the smallest cracks and crevices of the rock.

The occurrence of subangular, or even angular, pebbles in the sandstone has been alluded to. This fact, taken in conjunction with the abundant drift bedding and signs of contemporaneous erosion, strongly suggests action by an irregular agent. The entire absence (or practically so) of fossils in the upper portions of the sandstone, a formation which appears conformable with the true Eocene below, points to a marked change in the sequence of events which produced a change in the sedimentary deposits.

Recent.—Alluvium, sand, and black soil occupy the greater portion of the low-lying areas and depressions. The varying character of the fertile loams filling the valleys has suggested a lacustrine origin.† On the calcareous soils a deposit of nodular and earthy travertine occurs, which has been produced by lateral secretion from the metamorphic limestones on the west.

SEPTIFER SUBFENESTRATUS, sp. nov.



Shell inequilateral triangular, fairly convex; umbo strongly curved and marginal; dorsal line flat-convex; ventral margin straight or slightly inwardly indented. Ornamented with stout, longitudinal, angulated ribs, sometimes appearing bifurcated without being confluent, straight in centre, curved dorsally, the median ribs the thickest; also with finer concentric lines, occupying the interspaces and not traversing the ribs; few conspicuous folds of growth.

* Murray: Rep. Challenger Expedition and Proc. Roy. Soc. (London), vol. xxiv.

† Since the completion of the Happy Valley Reservoir a slight leakage of water southwards has been the means of destroying the vegetation along the course of its flow. The crystallisation of salt at the surface along this course is noteworthy.

Interior unknown.

Dimensions.—Length, 4.4; breadth, 2 mm.

Locality.—Vale Royal Vineyards, Happy Valley.

Horizon.—Eocene: Glauconitic sandstone.

Remarks.—The description has been made from a pseudomorphous cast in glauconite.

The species comes near to *S. fenestratus*, Tate; but differs from it by being a more stumpy shell, less acute anteriorly, and having a more rotund marginal outline posteriorly. The angle between the margin of the post-dorsal area and the dorsal line is less defined, and the ventral margin less curved. The ribs are stronger and fewer in number.

I have had opportunity of showing the specimen to the late Professor Tate and Mr. J. Dennant, who agreed with me in its specific variation.

THE GEOLOGY OF THE MOUNT LOFTY RANGES.
PART I.—THE COASTAL DISTRICT.

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[Read September 6, 1904.]

PLATES XXXVII. TO XLIV.

CONTENTS.

	PAGE
I. Introduction	253
II. Order of Succession—	259
(A) Purple Slates	260
(B) Brighton Limestones and Siliceo-Calcareous Series	262
(C) Tapley's Hill Clay Slates	264
III. The Field River Section	265
IV. The Onkaparinga Section	269
V. Southern Extension of the Calcareous Series (B) ...	278

I. INTRODUCTION.

The geological age and successional order of the rocks of the Mount Lofty Ranges have given rise to much discussion. The earliest observers, such as Jukes, Burr, Selwyn, and others, were content to use some general terms for their designation, such as "primitive schists," "primary," or "lower palæozoic," without risking any definite determination.

Mr. A. R. C. Selwyn (at that time Government Geologist of Victoria) in 1859 made an eight weeks' geological tour of the country, extending from Cape Jervis to Mount Serle. In his official report to the South Australian Government, Selwyn refers the palæozoic rocks met with in his journey to three divisions, which he named respectively *(a)* first stage; *(b)* second stage; and *(c)* third stage. These he regarded as probably distinct and unconformable, and with some hesitation classed them as Cambrian and Silurian, or possibly going as high in the series as Devonian.

Taking these three series in descending order, Selwyn defines their occurrence as follows:—

"*First.*—Those beds which occupy, in great anticlinal and synclinal undulations, the whole of the country north to Mount Serle, from a line drawn from the head of the Willochra north-easterly to the head of the Siccus River, consisting of:—1. The upper quartzose sandstone and quartz rock series; which, commencing with the summit of Mount Remarkable, extends through all the peculiar flat-topped and tent-shaped hills west of Port Augusta, and forms generally

the summits of all the higher peaks and ranges, as far north as Mount Serle, including the singular and picturesque Pound Ranges at Wilpena and Warraweena. 2. The hard, fine-grained, and micaceous green, grey, and purple slate, sandstone, and flag series. 3. The siliceo-calcareous series, or the Angorigina, Appealina, and Oratunga limestones. The dark blue, fine-grained arenaceous flags and sandstones of Appealina.

"*Second.*—The beds that occupy the whole of the country south from the above-mentioned line to Cape Jervis, consisting chiefly of slates, shales, and sandstones of various textures and colours with intercalated bands of gneissose, euritic, and micaceous schists, bands of quartz rock, and crystalline limestone, associated in certain localities, from the Gawler River south to Cape Jervis and Port Elliot, with eruptive granitic and hornblendic rocks.

"*Third.*—A series of beds, certainly the lowest in geological position in the whole of the central chain, but occupying a comparatively small area, chiefly confined to the watershed of the Onkaparinga. On these the only profitable goldfield hitherto discovered in South Australia is situated, and it is, I think, along the axis of these lower beds only that any important extension of the already known auriferous area can be expected." *

Selwyn was in error by referring his three main divisions to different geological ages, and as being unconformable with each other; and, at times, errs in fixing the geological horizon of the beds that he describes, but the order of succession laid down by this experienced field geologist is the correct one. He clearly shows that the purple slates, with their associated quartzites and calcareous beds, occupy the highest position in the series, and that the beds have a descending order as they outcrop to the eastward. With great discernment he forecasts the possibility of an error in his conclusions, and says:—"It is just possible that no such natural divisions exist in the rocks of the South Australian chain as are here sketched out, and that the difference in general mineral and lithological characters, observed between the northern and southern rocks, is entirely due to the metamorphic influence of the granitic axis that, at Cape Jervis, extends in a north-easterly direction, showing itself at intervals on the surface to Angaston, and then seems to break through the chain and continue its course to the north-east, passing under the great tertiary flats of the Murray basin; and, in all probability, again re-appearing in the Barrier or Stanley Ranges." †

* "Geological Notes," by A. R. C. Selwyn. Parl. Paper (No. 20), 1860, p. 14.

† Op. cit., p. 14.

Thirteen years later (1872) George H. F. Ulrich, late Senior Field Geologist to the Geological Survey of Victoria, reported to the South Australian Government on "the mineral resources of the country lying within 250 miles north of Port Augusta."* This author does not discuss the geology of the Mount Lofty Ranges in detail, but he corrects Selwyn's observations in one particular. He states:—"I agree with Mr. Selwyn, for the same reasons he advanced, in unhesitatingly assigning them (the rocks) to one of the older epochs of the palæozoic period—the Lower Silurian being perhaps the most likely one. Owing, probably, to my rapid mode of travelling, I was not able, however, to recognise the features upon which Mr. Selwyn based their subdivision into older and newer; for throughout the country traversed, from the Burra northward, I saw no evidence of any unconformity in the strata (the unconformable limestone patch noticed at the Sliding Rock Mine being, no doubt, much more recent); they seemed to me to represent one and the same grand series, only in places more or less metamorphosed by contact with intrusive rocks, as at Yudanamutana, near Mount Emily, Mount Plantagenet, and, perhaps, in a number of other localities.

Little further attention was given to the geological characteristics of the fundamental rocks of South Australia until the late Professor Ralph Tate entered upon his duties as Professor of Natural Science in the Adelaide University in 1876. In the following year Tate delivered a series of ten lectures under the auspices of the University on "The Ancient Physical Geography and Geology of South Australia." In the succeeding year (1878) he placed his views on permanent record by a fuller exposition of his conclusions on the geological outlines of the colony in a Presidential address,† delivered before the Philosophical Society of Adelaide. In his scheme Tate divided the older rocks into two main divisions, viz.:—*(a)* Pre-Silurian, and *(b)* Lower Silurian. He was led to these determinations mainly by the discovery made, shortly before, by Mr. J. G. O. Tepper, of a fossiliferous limestone of palæozoic age at Ardrossan, Y.P. Tenison Woods‡ had previously advocated the Silurian age of the Mount Lofty Ranges, in reply to whom Tate said:—§"Recent discoveries, which have been communicated to this Society by Mr. Tepper, necessitate their relegation to a much more ancient

* "Mineral Resources North of Port Augusta." Parl. Paper, (No. 65), 1872, p. 15.

† Trans. and Proc. of Phil. Soc. of Adelaide, vol. ii., 1878-9, p. xxxix.

‡ "Geological Observations in South Australia," pp. 20, 21.

§ Pres. Ad. Op. cit., p. xlv.

epoch. The chief facts are that in the neighbourhood of Ardrossan a lower series of metamorphic slates and limestones is covered unconformably by fossiliferous limestones of the Lower Silurian epoch; and, though the lower series, underlying the fossiliferous limestones and associated strata about Ardrossan, cannot be brought into direct relationship with the fundamental rocks on this side of St. Vincent Gulf, yet their mineral character and sequence place them in accord; and the same may be said of the rocks constituting the high lands on Eyre's Peninsula." In this quotation Tate co-ordinates the Mount Lofty beds with the basal beds at Ardrossan, which at the time he classed as pre-Silurian, and later as Archæan; the grounds of their assumed identity being based chiefly on their supposed lithological resemblance.

Tate also differed from Burr, Selwyn, and Ulrich in his view of the order of succession shown by the Mount Lofty beds. The earlier observers mentioned believed that the beds passed from newer to older in their eastward extension, whilst Tate interpreted them in the reverse order. In the address already quoted he says:—* "The strata composing the principal range of South Australia have a general dip to the south-east, and show a succession of clay slate, with quartzite bands, crystalline limestones, mica slate, and other decidedly metamorphic rocks, and granite. It is remarkable that the apparently less metamorphosed strata occupy the lowest position, whilst the uppermost stratum is gneiss, unless we regard the granite, which follows next, in the light of the extreme of alteration of which the gneiss is an earlier phase. That the highly metamorphic rocks do not form the axis of the Adelaide chain is beyond dispute, and in various traverses across the strike of the strata of our hills I have failed to detect faults or inversion, which would account for their exceptional position, whilst, on the contrary, the successional arrangement is sufficiently clear to leave little room for question."

The above assumption, that the Mount Lofty Ranges, throughout their entire width, represent a single monoclinal fold, would involve an enormous thickness of beds. This view is maintained by the late Professor Tate, who quotes Selwyn's estimate that the beds between Normanville and Encounter Bay are nearly 30,000 ft. in thickness, and adds, "There cannot be a doubt that the thickness of these fundamental rocks is much greater in those portions of the central chain, near Adelaide, than in the Cape Jervis promontory." He also quotes Mr. Scoular, who believed that the beds exposed in the South Para River had a thickness of

* Op. cit., p. xliii.

90,000 ft., and that "this thickness is not a moiety of the whole." *

Mr. H. Y. L. Brown, Government Geologist, in his Annual Report, 1883, published a general outline of the geology of South Australia, accompanied by a geological map and sections. A revised edition of the map was published in 1886, in which the following order of the older rocks was given:—

Palæozoic—(?) *Devonian.* Tent Hill formation, west of Port Augusta.

Palæozoic.—*Lower Silurian.* Clay slates, quartzites, limestones, etc., from Cape Jervis to Mount Babbage, etc.

Palæozoic or Azoic.—Metamorphic. Mica and talcose schists, quartzites, crystalline limestones, etc.

Archæan.—Metamorphic granite. Gneiss, hornblende, and mica schists, crystalline limestones, etc.

These divisions are represented on Mr. Brown's map in three parallel bands of colour, and the descending order of the beds is indicated as occurring in their passage from west to east.

The geology of the Mount Lofty Ranges is further illustrated by Mr. Brown, in his report, by a sketch section across the ranges from Adelaide to Strathalbyn. There is, however, an apparent discordance between Mr. Brown's map and section. Whilst the former shows an order of succession in which the older beds occur on the eastern side, the section shows the lowest beds to occur on the western side. A regular south-easterly dip is shown, in the section, from the west coast to the Onkaparinga River, from which position the upper beds, in isoclinal foldings, continue to their eastern limits.

As opposed to the monoclinal theory of Professor Tate, Mr. Brown says:—"The general dip of the rocks comprising the Mount Lofty Range is to the south-east, and, as it continues eastward for a distance of some twenty miles, the thickness therefore indicated of the entire mass would be immense. The occurrence of dykes and masses of granitic rocks here, coupled with those to the north, as well as eastward and westward in other parts of the colony, indicate, I think, the probability of granite and other plutonic and igneous rocks underlying the sedimentary rocks at a certain depth underneath the whole area, either as eruptive or metamorphic masses. In this case faults and inversions of the strata must have taken place, which will account for the position of the beds and their apparent great thickness." †

* Op. cit., p. xliv.

† Ann. Rep. Govt. Geol., Parl. Paper, 1883, p. 10.

Professor Tate made a still more emphatic statement of his views on this subject in his inaugural address before the Australasian Association for the Advancement of Science, held in Adelaide in 1893. In dealing with the "Fundamental or Archæan Rocks" of Australia, he said:—"The generalisation which has sought to sweep all the crystalline rocks of Australia into the great Silurian net has been broken down by the discovery of unconformably super-imposed Cambrian strata, and, though it by no means follows that the whole of the crystalline rock masses are of Archæan age, yet there are good reasons for the belief that those rocks which exhibit the phenomenon of regional metamorphism belong to one epoch. . . . The grandest exemplification of the Archæans is in the Mount Lofty Range of South Australia. These rocks occupy there a vast monocline, with a dip to the south-east of not less than ten miles in thickness. One noteworthy lithological feature is the more highly developed metamorphism of the upper strata, mica schists, gneiss, and granite succeeding, in an ascending series, clay slates, quartzites, and limestones. This exceptional phenomenon was recorded by Jukes in 1850: 'The prevailing south-easterly dip would put the clay slates under the gneiss, mica, and chlorite slates'; and independently observed by Selwyn,* in 1860 [(?) 1859]. The non-acceptance of this view by the Government Geologist of South Australia has compelled him to reverse the order of succession, and he classes the lower series as 'Silurian (and Devonian) metamorphic in part,' and relegates the upper to 'Palæozoic or Azoic, highly metamorphic.' "†

In a new edition of the geological map of South Australia by Mr. H. Y. L. Brown, Government Geologist, published in 1899, the Mount Lofty Ranges are defined as "Cambrian and (?) Lower Silurian." Later discoveries have strengthened the positions of Selwyn, Brown, and others, who have held that the Mount Lofty Ranges, in the main, belong to a post-Archæan age, and have an inferior order of succession from west to east, rather than those views so strongly held by Professor Tate.

An important factor in the chain of evidence was obtained when, in 1897, Professor David and the writer discovered *Archæocyathinæ* remains in the limestones of Normanville, which were subsequently traced along the line of strike for a distance of twenty-five miles, to a point three miles to the

* I cannot draw the same inference from Selwyn's report on this subject that Professor Tate has done.

† Aus. Ass. Ad. Sc., vol. v., p. 45, *et. seq.*

north-east of Willunga.* This important find demonstrated a definite Cambrian horizon striking through the heart of the Mount Lofty Ranges. A suggestion from the writer, that this discovery had great significance in relation to the geological age of the Mount Lofty Ranges, and might require a reconsideration of the position, was met by Professor Tate, in the discussion which followed the reading of the paper, with strong opposition. The professor stated that "the beds in which the fossils were found probably constituted only a spur of the ranges, and did not affect the question in its bearings on the age of the Mount Lofty Ranges as a whole."

The subject had reached such an interesting stage that no other stimulus was required to pursue it further. After several years of field study, directed to this object, I have now the honour to place the results of my observations before the Society as a first contribution towards a systematic elucidation of the structure and succession of the older rocks of this State.

The existence of a bed in the series with such distinct lithological characteristics as that possessed by the older glacial till, and its remarkable persistency, have greatly simplified the work attempted; for wherever this bed occurs it supplies a datum line from which the geological section can be interpreted and the associated beds placed in their consecutive order, even in the most remote localities.

I have taken the country in the neighbourhood of Adelaide as the type district of the series, and the beds which outcrop between Mount Lofty and the sea may be regarded as the index to most, if not all, the Palæozoic rocks of the State.

II. Order of Succession.

So far as the foot hills and coastal districts near Adelaide are concerned, the Palæozoic beds appear to belong to a conformable series, and may be subdivided into well-marked divisions, as shown in the following order in superposition, viz.: —

(A) *Purple slates, quartzites, and limestones*—Marino, Hallett's Cove, Lower Onkaparinga.

(B) *Siliceous, blue, pink (oolitic), and dolomitic limestones*—Brighton, Field River, Hackham, &c.

(C) *Banded, fine-grained clay slates and shales*—Tapley's Hill, &c.

(D) *Glacial till, grits, etc., with erratics*—Sturt River, Onkaparinga River, &c.

(E) *Siliceous and felspathic quartzites and phyllites*—Mitcham, Glen Osmond, Magill, etc.

* "The Occurrence of Low. Cam. Fossils in the Mount Lofty Ranges." Trans. and Proc. Roy. Soc. S. Aus., vol. xxi., p. 74.

The present paper is limited to a description of the three upper members of the series, with special reference to their development in the Field River and Onkaparinga districts.

(A) **Purple Slates.**

It is convenient to adopt this heading for a great series of slates, shales, flaggy sandstones, quartzites, and limestones which are more or less distinguished by a dark purple or chocolate colour. There is apparently no stratigraphical break between the Brighton limestones and these dark-coloured beds; but the lithological distinction between the two divisions and the superposition of the purple slates are clearly defined. The fact that these beds are mostly submerged by the waters of the Gulf, in the neighbourhood of Adelaide, no doubt accounts for the fact that they have not been studied to that extent which their importance demands. In the sea cliffs between Marino and Hallett's Cove, as well as on the beach, planed down by the sea, it is easy to recognise the marked contrast which these beds present to any others on their eastern side. Dark-purple slates, sometimes chloritic, splitting up into small flakes and prismatic pieces, line the coast. The cliffs are almost on the line of strike, and expose the waste of a great anticlinal fold facing the sea. Interstratified with these dark shales will be found very hard-grained and dark-coloured quartzites, often divided up into thin beds and laminæ, and a few similarly coloured, thin limestones, hardly to be distinguished from the associated argillaceous beds, and often indicated by containing white veins of fibrous calcite.

At Marino these beds have a breadth of barely half a mile before they pass below sea level, to re-appear on Yorke's Peninsula as the *Archæocyathinæ* limestones, underlain by purple slates, etc., as on the eastern side of the Gulf. These beds, inferior to the fossiliferous limestones, have been proved in the Maitland bore, they outcrop on the Winulta Creek, and are seen in the railway cuttings between South Hummocks and Kulpara. Characteristic exposures of these beds occur at Black Point, on the north side of Hallett's Cove, where they have been intensely glaciated; and on the lower Onkaparinga, at the Horseshoe, where they formed the old sea cliffs of Miocene age. Along the line of strike, between Field River and Curlew Point, about three miles south of Hallett's Cove, there has been a zone of extreme pressure and contortion, with overfolding of the beds. Some excellent photographs of these features, taken by Mr. J. Greenlees, accompany this paper. (See Plates xxxvii.-xlii.)

To study these beds in their vast extent and most interesting features it is necessary to see them as developed in the Flinders Ranges. On the western side of Mount Remarkable they comprise the Black Range, where they have a dip to the west. Further north, near Wilmington, they form the eastern flanks of the vast anticlinal fold of Horrocks Pass; and then, in the neighbourhood of Quorn and northwards, they spread out and form the ranges of the Northern Flinders, and in low exposures can be traced in the eroded hollows separating the cretaceous outliers along the southern and western shores of Lake Eyre. Fine examples of their rugged peaks and steep declivities flank the railway from Mern Merna to Parachilna, and include, at no great distance, the great synclinal fold of the Wilpena Pound. The Parachilna Pass to Blinman is one of the most impressive pieces of rock scenery that exists in the State. The bare hills, of great height and deep chocolate colour, exhibit scoured sides and rugged outcrops that can be followed by the eye for miles, with all the distinctness of a blackboard demonstration. In places faults of great magnitude are seen to cleave the hills in broken and contorted lines. In this latitude the purple slates series is continuous, from the railway eastwards to Frome Hill, a distance across the strike of fifty miles. The Blinman Mine is in this series, and owes its existence to a fault in the rocks in close association with an igneous dyke.

One of the most striking features of this division is the prevalence of limestones of varying thickness, up to about a hundred feet. Some of these limestones are composed almost exclusively of the remains of *Archæocyathinæ*, which must have formed thick reefs in the Cambrian sea. Several parallel outcrops of thick limestones carrying these remains were observed in a recent visit, and in some instances traced for many miles along the strike. In the neighbourhood of Wirrialpa Station a number of thinner beds of limestone occur, exhibiting remarkable colitic and other forms of structure; and in some of these limestones brachiopod remains were found in considerable numbers, running in fossiliferous bands. I can but briefly refer to these features at present, leaving for a future occasion a more detailed description of this interesting district.

The age of the purple slates division is determined as Lower Cambrian,* from its *Archæocyathinæ*, *Salterella*, *Microdiscus*, and associated forms. It was my good fortune to find at the base of the cliffs, near Marino, a sea-worn pebble of purple limestone, containing organic remains, which

* Etheridge: Trans. Roy. Soc. S. Aus., vol. xiii., 1890, p. 10. Tate: id., vol. xv., 1892, p. 183.

Mr. Etheridge, of Sydney, to whom the specimen was submitted, referred to the *Archæocyathinæ.* There can be little doubt that the specimen came from one of the local rocks, as it carries a close lithological resemblance to them. This adds a palæontological proof that these beds belong to the purple slates division; to which, on the grounds of their stratigraphical position and lithological features, they had already been referred. As the purple slates division occupies the superior position in the Mount Lofty series, it fixes the latest time limits that can be applied to those members of the series which are inferior to these beds.

(B) Brighton Limestones and Siliceo-calcareous Series.

Between the Tapley's Hill shales and the purple slates there is a belt of calcareous rocks which, from earthy and siliceous limestones, in their lower beds, pass up into strong and good limestones near their upper limits. The typical order of their occurrence is as follows:—

	Approximate thickness.
(a) Buff-coloured (dolomitic) limestone ...	8 feet
(b) Pink-coloured (oolitic) limestone	15-20 feet
(c) Blue-coloured (siliceous) limestone ...	15-20 feet
(d) Dark-coloured (very siliceous) limestone	400 feet

(a) The top bed of this division is a yellowish or buff-coloured dolomitic limestone, averaging about eight feet in thickness. It is a very persistent member of the series, and is found in precisely the same relative position, in these beds, both to the south of Brighton and in the Flinders Ranges. It has not been applied locally to any economic purpose. Its toughness under the hammer makes it unsuitable for stone-breaking. Nodules and incrustations of magnesite are often found in its vicinity.

(b) Underlying the dolomitic limestone is a thick, strong limestone, of a brownish-pink colour, commonly known as "the pink limestone." In structure it is finely oolitic, and is the purest limestone of this calcareous group, averaging 86 per cent. of calcium carbonate. It has an extensive use for road metal, along the line of its outcrop, and is one of the chief constituents used by the South Australian Portland Cement Company, at Brighton, for manufacturing an hydraulic cement of excellent quality.

(c) The blue (siliceous) limestone immediately underlies the pink-coloured limestone. The line of distinction is not

always very apparent between the two beds, as the upper part of the blue limestone is often mottled with patches of a pinkish colour. In parts, it exhibits a similar oolitic structure, as shown by the pink limestone. It contains 40 per cent. or more of silica. It is fairly uniform in composition, and is applied to the same economic uses as the overlying bed, being worked up in the manufacture of cement, and is locally known as the "blue metal limestone," from its application to road-mending. It frequently carries crystals of pyrites and amethystic-coloured cubes of fluorite. At Brighton, large globular and mammillary crusts of barite have occurred on the surface of the blue limestone, the mineral having a finely fibrous structure and silky lustre.

(d) The lowest member of the group comprises a series of dark-coloured, very siliceous limestones, of variable composition, but much more siliceous than the over-lying bed *(c)*. Indeed, the beds vary from distinctly characteristic siliceous limestones to earthy, calcareous shales. This division, as a whole, is distinguished by the possession of a faintly laminated structure, which, on weathering, becomes more strongly marked. At some horizons the siliceous limestones exhibit in vertical (weathered) sections a peculiar vermiculate structure, which, at first sight, is very suggestive of fossil remains. On splitting the stone parallel to the bedding planes it is seen that this effect is produced by the occurrence of thin, wavy films of mineral matter in irregular patches. This striking feature is very characteristic and persistent, and forms an excellent means of fixing the geological horizon when these beds are seen in outcrop.

The above calcareous division, which for convenience I have grouped under the heading of the Brighton limestone series, takes rank as one of the best-marked horizons in South Australian geology. The belt can be easily traced in outcrop from Brighton, southwards, to Reynella and Hallett's Cove. At Hackham it has been extensively quarried. It crosses the Onkaparinga about a mile above Noarlunga, and can be traced further southwards until it disappears under newer deposits, shortly before reaching Aldinga. Its northerly extension is, in the first instance, obscured by the alluvial of the Adelaide and Gawler Plains, but it re-appears at the Burra, Mount Remarkable, Orroroo, Walloway, etc. The diversity of its economic products may be seen in that it has been worked for road metal at Reynella and other places, cement at Brighton, copper at the Burra, phosphates at (?) Fairview, and flux at Orroroo. The relative thinness of the beds and their solubility have led to their denudation over vast areas where they formerly existed.

Although frequently looked for, no fossil remains have been found in these limestones except a few casts of Radiolaria. This is the more remarkable as the limestones have been, as a rule, but little altered under metamorphic action. The fossiliferous pebble found on the coast, near Brighton, referred to above, has apparently come from a limestone slightly higher in the series, and belongs to the purple slates division. Descriptions of the Radiolara observed, and fuller remarks on the Brighton section, will be found in a "Note on the Occurrence of Casts of Radiolaria in Pre-Cambrian (?) Rocks of South Australia." (Proc. Linn. Soc. N.S.W., 1896, p. 571.) The paper containing these descriptions was written under the prevailing view, held at that time, that the western flanks of the Mount Lofty Ranges were probably of Pre-Cambrian age.

(C) Tapley's Hill Clay Slates.

Tapley's Hill is on the Main South Road, about eight miles from Adelaide, and due east from Brighton. The so-called "hill" is, in reality, the escarpment of the older rocks, which, in a curve to seawards, determine the southern limits of the Adelaide Plains. From the summit of Tapley's Hill a coastal plateau stretches southwards to the Onkaparinga.

The hillside is marked by numerous quarries, and the stone won is extensively used in Adelaide for kerbing and building. It is a very fine-grained, homogeneous stone, which cleaves easily at a high angle to the bedding planes. This cleavage, associated with cubical jointing, makes it a free-working quarry stone. The bedding plane, or grain of the stone, is marked by a banded structure, which, from carrying a protoxide of iron, becomes strongly developed in weathered faces, giving it the character of a "ribbon" slate. This banded structure is a very constant and characteristic feature, and is usually sufficient to determine the horizon when these beds are met with in distant localities.

The lithologcal type of this division is remarkably uniform. It is incapable of subdivision, as it practically consists of a single bed of great thickness. Although seen in many places I have not in a single instance detected a quartzite or arenaceous band throughout its vertical extent. The beds are often sub-calcareous, and, by a process of leaching, produce a superficial travertine deposit, which fills in the crevices and cements the fragments of shale which form the outcrops. There is no well-defined limit between these clay slates and the calcareous series which immediately overlie them. The upper parts of the Tapley's Hill beds become more calcareous whilst preserving their banded structure, and pass conformably up into the siliceous limestones of the member above.

In the type district these beds can be studied to advantage in the Tapley's Hill quarries; along the spur, which connects Tapley's Hill with the coast at Marino; in the bed of the Onkaparinga, where they have been crushed into short, wavy contortions; and in other outcrops. North of Adelaide they are of frequent occurrence, intercalated with other members of the series. On the west side of Mount Remarkable they are thrown down to the face of the great Spring Creek fault; and in the Horrocks Pass, near Wilmington, they make a very imposing feature, capped towards the sea by an escarpment of limestone, which, as the next in ascending order, can be referred to the Brighton series, the whole face being probably a thousand feet in height.

In some parts of the north the beds have not developed cleavage, but split readily in laminæ parallel to the bedding, producing thin flagstones. This is the case in their occurrence on the western side of Mount Remarkable, in a position where their determination, as belonging to the Tapley's Hill horizon, is placed beyond all doubt. In places, both north and south, the beds have become much decomposed and converted into a kaolinised rock.

To further elucidate the stratigraphical features of the beds in question, two sections, in the type district, will now be described in some detail.

III. The Field River Section.

The small stream, which has received the dignified name of "river," takes its rise near the Happy Valley Reservoir. The stream crosses the Main South Road one mile north of Reynella, from which point it follows a meandering course of four and a half miles, and finds its outlet to the sea at Hallett's Cove. The line of section shown in the diagram (Plate xliii., fig. 1) is about three and a half miles in length, and in a direction a little north of east and south of west. In the upper part of the stream the section has been taken from the outcrop shown on the north bank, and in the last mile from the south bank. The general strike of the beds is north and south, with a prevailing dip to the west. The beds, however, roll considerably along the line of strike, in consequence of which there is frequently an apparent dip to the south.

As already intimated, there is no defined line of distinction between the Tapley's Hill slates and the calcareous series which immediately overlies them. The passage is indicated by a gradual increase of carbonate of lime in the stone. The bridge over the Field River, on the South Road, may be conveniently taken as the line of demarcation. On the west side of the bridge the stone is a calcareous, banded

shale, somewhat resembling the Tapley's Hill stone, but has more lime in it, and is overlain by beds of siliceous and earthy limestones, which, in weathering, show the earthy particles and layers in relief. The beds roll slightly, but have a general dip varying from 15° to 20° south-west.

Half a mile from the bridge, down stream, in Section 509, Hundred of Noarlunga, a quarry has been worked by Mr. Reynell for road metal, in a thick, siliceous limestone, with a quarry face 50 ft. in height. The stone shows markedly the vermiculate structure already referred to. When the stone is split along the planes of the wavy lines, they are seen to consist of broad, uneven films of earthy silicates, separated by siliceous limestone. The lines often run nearly parallel, in pairs, which gives a striking resemblance to organic remains seen in section.

In the adjoining section (519), a little west of the district road which crosses the river, is the most important quarry in the limestones of the Field River, and is worked by Mr. Pocock. It is clearly the same set of beds as occur in the quarries of the South Australian Portland Cement Company at Brighton. The siliceous limestones, blue limestone, pink limestone, and magnesian limestone follow each other in an ascending series in the same order in both localities, which are separated by a distance of three and a half miles in a direct line. The limestone has been thrown into a series of anticlinal and synclinal folds across the strike. Pocock's quarries have been opened near the crest of the most eastern anticline. The eastern limb of the fold, as seen in the main quarry, has a dip of 25° south-south-east, and has suffered a denudation, which exposes the underlying, earthy, and siliceous limestone on its eastern side. The ground between Reynell's and Pocock's quarries is occupied by a shallow synclinal fold, which brings in a small outlier of the limestone, seen on the district road and paddock to the east, but makes no prominent feature.

Pocock's quarry exhibits a fine face of good limestone, 40 ft. in thickness, with a dip slope towards the valley. The stone varies in colour from bluish to pink, and is oolitic in structure. A large, V-shaped mass of rubbly, magnesian limestone has latterly been encountered, replacing the good stone and greatly affecting its quality. This intrusion necessitated the opening of a new quarry about a chain length to the west of the old one. Here the stone is found to be sound, and has a dip of 48° to south-east. The west side of the hill (on which Pocock's quarry is situated) forms a dip slope of the anticline, in its western limb. Near the centre of the fold the dip is at 80°, which rapidly decreases

to 45° south-south-west, making a synclinal fold with the next hill on its western side. In this synclinal trough, what is known as the "hard bed" is seen to overlie the main limestone. It is really tough, rather than hard, and is a yellowish, dolomitic limestone, with calcareous and ferruginous shales. This outcrop of dolomitic stone is about a chain wide. The beds dip south-south-west at 30° on the eastern side, and at a distance of fifty yards the dip changes to south-south-east at 20°. The dolomitic beds cross the stream in Section 507, passing under hard, siliceous, purple slates, which are exposed in a thick face on the southern banks of the river and have a dip of 20° south-south-east.

In the same section (507) another thick face of the main limestone is seen on the site of an old quarry. Here the dip reverts to the south-west. From this point the beds continue to exhibit gentle anticlinal and synclinal foldings in their westward extension; with the effect that the limestone is cut out on the boundary of Sections 506-507, and the lower beds of siliceous limestones form the outcrop.

Near the western boundary of Section 506, and within a quarter of a mile of the old smelting mill, a well-marked fault occurs. The fault has a strike north-east and south-west, with a hade to the north-west. On the eastern side the beds form an anticline, and have a sharp downthrow against the fault at 65°, whilst on the west side the dip is only 10° to (?) east-north-east.

For about half a mile from the fault the valley runs more in a line with the strike of the beds, and exhibits fine examples of strike folding. In Section 574 a great anticlinal fold occurs which is one of the most striking features of the geological section. (See Plate xxxvii.) The stream makes a sudden turn at the spot, and has cut back the cliff in an almost perpendicular face of one hundred and fifty feet, in siliceous limestones. The eastern limb of the anticline has a dip of 30°, and the western about 20°. Apparently there is a sharp bend or fracture in the beds, near the axis of the anticline, where the beds pass suddenly from a higher to a lower angle of dip. In consequence of the stream turning almost at right angles at this point, it has exposed, north and south, as well as east and west, sections of the beds. The latter, or main anticline, shows the folding in the direction of the dip; whilst the north-and-south section gives an instructive example of folding along the line of strike. These are typical examples of the local disturbances of the strata and are good illustrations of the difficulty which often presents itself of distinguishing the direction of dip from strike amidst the complex folding which has taken place.

The great anticline, just described, is the first indication of approach to a very disturbed area. On the western side the rocks rapidly increase in dip to 60°, in a west-north-west to west-south-west direction. This high angle of dip once more brings into the section the main limestone, followed by the yellow dolomitic limestone, with a dip of 60°-70°. These beds are in all respects similar to the corresponding outcrops higher up the valley, and have a surface spread of thirty yards.

There immediately follow, in ascending order, purple calcareous slates, green slates, and quartzites. These beds mark the passage upwards to the purple slates division, which is the highest member of the series. There is the strongest lithological contrast in the appearance of the beds belonging to the respective divisions, and cannot fail to be noticed. Near the junction a very high cliff of purple slates occurs on the northern side of the stream, and in the face of this cliff the adit of the old Worthing Copper Mine (which failed to secure ore in payable quantities) has been driven. As is common in the purple slates, the beds are much cleaved and jointed, and readily break up into small prismatic fragments, making the determination of the bedding planes somewhat difficult, but they are here at a high angle of dip. The succeeding beds become more siliceous, and split up into numerous thin beds of quartzite and shale, which are greatly contorted by acute and inverted foldings. The alternation of beds of unequal compressibility has, no doubt, supplied favourable conditions for producing these effects. (See Plate xxxviii.) About half a mile from the coast there is a calcareous belt in the rocks which shows a wavy structure, and is succeeded by more purple slates, calcareous grits, greenish to purple slates, and quartzites to the mouth of the river, where the cliffs consist of thin bedded, dark-coloured quartzites and shales, with a dip of 85° to the west. The cliffs are capped by glacial drift and a superficial covering of Miocene sands and clays.

At Black Point, the north headland of the bay, a very striking anticline occurs in the purple slates, with a sharp downthrow to the west. The top of the cliff is strongly glaciated, and within the amphitheatre, formed by the erosion of the rocks between the headlands of the bay, the glacial drift, a hundred feet in thickness, occupies an eroded basin in the purple slates. A section across the beds can be seen in a small watercourse, situated about midway between the two headlands, and at about half a mile from the sea a very acute anticlinal fold in quartzite can be seen forming a small waterfall.

A little south of the Field River there is an extensive floor of marine denudation produced by planing off the purple slates, which exhibit parallel lines of outcrop on the beach. The lines give a very clear exposure of the bedding along the strike, and, when the tide is out, a remarkable example of a strike overfold is seen in the form of a very extended letter ∽. It can be seen to best advantage from the top of the cliffs.

The most striking illustrations of the acute foldings which occur in these beds are found at Curlew Point, about three miles south of Hallett's Cove. (See Plates xxxix.-xlii.)

The purple slates pass out of sight below sea level, with a dip to the west. The waters of the gulf occupy a deep valley cut in these beds; in the first instance, possibly, by a river which had its watershed in highlands to the south of the present continent, and its outlet to the north. These southern highlands were in existence, as a watershed, during the (?) Permo-Carboniferous glaciation of the southern portions of Australia, and must have been, even at that time, of considerable elevation and extent, to produce a ground ice of such magnitude as to fill the valley of the gulf and overlap the adjoining land. The purple slates re-appear on the other side of the Gulf, where they are relatively thin, and rest on Pre-Cambrian beds. They are overlain by thick limestones at Curramulka, Ardrossan, Maitland, Clinton, Kulpara, etc., which contain characteristic fauna of Lower Cambrian age.

IV. The Onkaparinga Section.

Introduction.—The Onkaparinga River flows through a gorge which is, perhaps, the most inaccessible and roughest in the southern portions of the State. Between Noarlunga and Clarendon the sides of the valley rise abruptly from 300 to 600 feet in height. About two miles from the coast the river suddenly leaves the highlands and enters the plain, forming a picturesque loop known as the "horseshoe," within the limits of which the township of Noarlunga is built. At this point the river has reached its base level, the water being tidal on one side of the narrow neck of land and fresh on the other. From Noarlunga to the sea the river follows a tortuous course, with alluvial, estuarine, or tertiary banks, which continue to its mouth. Deep as is the gorge of the river it is evident it must have been cut since later Miocene times, as deposits of this age cap the hills on both sides of the river. It is possible that in pre-Miocene times the river had its outlet by Maclaren Vale, which is now choked with Miocene deposits. High-level gravels of the river bed can be seen at Noarlunga, near the top of the Church Hill, on its western side.

The Palæozoic rocks, which constitute the gorge, continue in outcrop along the east and south sides of the "horseshoe," until they reach the centre of the convex bend, when they abruptly give place to marine Miocene beds. The older rocks form the basal beds of the narrow neck of land in the bend, and are exposed for about a quarter of a mile along the right bank of the river, as it leaves the township to the north-west. On the north side of Noarlunga the Palæozoic rocks run for a mile or more parallel with the Adelaide road, on its eastern side, whilst the whole of the country on the western side, as far as the coast, consists of older and newer tertiary beds, most of which has been brought under cultivation. Several road cuttings give sections of these beds, and in the case of one, situated a little north of Hackham, marine fossils, of Miocene age, are found in a series of sands and fine gravels. About a quarter of a mile down the river from Noarlunga, a white, marly clay, similar to Witton Bluff, on the coast, makes a cliff twenty feet in height, and passes under water level. The bed contains crinoid stems, spines of echini, *Turritella aldingæ*, brachiopods, etc. These fossiliferous clays rest on coarse, sandy beds, which show a dip of 25° west; but, as the latter abut against a nearly vertical face of the older rocks which formed coastal cliffs of the tertiary sea, it is probable that the apparent dip of the beds arises from the deposits having been laid down on a shelving beach. The tertiary beds, on the south side of the river, are bounded by the Palæozoic outcrops, which gradually trend towards the coast.

The beds exposed in the gorge of the Onkaparinga correspond with those already described as occurring in the valley of the Field River, but the former have been subjected to much greater disturbance by faulting. The less cover on the highlands bordering the Onkaparinga, and the deep tributary gorges of the valley, permit a more complete study of the plan of the beds than is possible in the Field River and Brighton districts.

Purple Slates.—In consequence of the westerly trend of the coast the outcrop of purple slates, which at Marino, near Brighton, is only half a mile wide, increases to a mile on the Field River; and on the Onkaparinga, when measured in a direct line from the coast to the eastern limits of the faulted sections, is nearly four miles wide.

On the north side of Noarlunga these slates cross the main road and are exposed at the base of the cliffs, on the right bank of the river, for a quarter of a mile, capped by tertiary beds and old river gravels. On their western limits the purple slates end abruptly in a steep cliff facing the west,

having a dip of 60°, whilst the tertiary beds rest unconformably against the face of the older slates. The latter exhibit a series of anticlinal and synclinal folds, reaching a maximum dip of 65°. Near their western extremity a synclinal fold occurs, in the centre of which the beds are much broken and confused.

The hill on which the Noarlunga Church stands, together with the eastern side of the "horseshoe," and for more than a mile up the river, the purple slates show a great development, forming hills several hundreds of feet in height. In the cliff face under the church the beds dip south-south-west at 15°, and for a mile up stream they exhibit an undulating dip, which, for the most part, is at a comparatively low angle.

In Section 63, near the mouth of a small tributary on the south side of the river, the beds increase in dip, with a roll from south-west to south-east and south-south-east, at 40°. Following up this gully an instructive section is obtained. The dip changes to west at 60°, and the beds develop marked cleavage, which has a north-and-south strike, with an easterly dip at 48°. The appearance of this outcrop from across the valley is misleading, as the chief weathering is shown on the cleavage planes, giving a wrong impression as to the lie of the beds. Higher up, the dip passes rapidly to west-north-west at 73°, and at the junction of an eastern branch of the creek the dip is temporarily changed to south-east at 20°, but in a few yards reverts to the west. Following the eastern branch, in a short distance the beds become vertical, changing again to east-south-east at 73°, as they abut against the great strike fault (C) (see map, Plate xliv.) which runs in a north-east and south-west direction, and crosses the Onkaparinga, near the Ford, between Sections 48 and 56.

The main body of the purple slates on the Onkaparinga is circumscribed by two great faults. On the north the beds are cut off by an important dip fault, running east and west, through the northern parts of Sections 46, 47, 48; and by a strike fault, having a direction north-east and south-west, crossing the river at the Ford. In addition to this main outcrop there are other important areas occupied by these beds which will be referred to when dealing with the faulting that has taken place on the eastern side of the field.

Lithologically, the purple slates of the Onkaparinga district very closely resemble those which occur in the Field River, Hallett's Cove, and Marino outcrops. The stone is extensively jointed and cleaved, has a characteristic banded appearance, caused by alternating darker and lighter bands

of a purple colour, and is frequently ripple-marked. Occasionally quartzites are developed, but they do not attain any considerable thickness.

The limestone, corresponding to that worked at Brighton and the Field River, is greatly disturbed and faulted in this district. In composition and structure it is identical with the outcrops further north, but the severe mechanical strain it has been subjected to is shown by the limestone being often ramified in all directions with veins of calcite and other minerals, which have filled and healed the rents produced by the crushing of the stone.

About three-quarters of a mile south from Hackham the limestone is seen on the east side of the road, in Section 40, forming a round hill, which has been extensively quarried. The stone exposed in the quarry is about thirty feet in height and is a dark blue limestone, thickly studded with calcite, which is frequently mixed with fluorite and pyrite. It is extensively used for road metal, but the readiness with which the calcite breaks down on the rhombohedral cleavage makes it less serviceable for this purpose than the more uniform stone of Field River. On the rise of the hill, above the quarry, the stone passes up into pink-coloured limestone and yellow dolomitic varieties, characteristic of these beds in other localities. The dip is east-south-east, at a low angle, the quarry being situated near the axis of an anticlinal fold, the western limb of which has been denuded. In a small creek on the south side of the hill an old quarry, worked on the same line of stone, gives an exposure of both limbs of the anticline. The limestone has an outcrop of only about half a mile in length, being cut off at both extremities by faults; a strike fault (A) runs nearly parallel with the limestone, on its eastern side, and cuts it off just north of the Hackham quarry, and a dip fault (B) cuts it off near the district road on the south.

The limestone and associated beds have a south-west trend, skirting the agricultural ground which occupies the bottom of the valley. From the main quarry they can be traced across the first creek, in which the anticlinal fold, referred to above, is seen; they then follow the base of the next rise and are well exposed in the next creek (Section 39), as strong beds of blue limestone, forming a small waterfall. Dip, east-south-east, at 34°. From this point, and through Section 47, the outcrop has to be followed chiefly by a thick crust of travertine, which ends on the district road running north and south, at a point about 200 yards south of the main road. Here the limestone beds are cut off to the south by the dip fault, already referred to, and purple slates

take their place. About 200 yards higher up the hill than where the limestone beds reach the district road there is an outcrop of tertiary beds which follow the crest of the hill, nearly to the banks of the Onkaparinga, and are more or less covered with a travertine crust, which must not be confounded with the travertine of the older formations. The corresponding hill, on the opposite side of the main road, is also composed of tertiary calcareous sandstones and travertine.

From the trend of the limestone from Hackham, the line of strike should intersect the Onkaparinga near Noarlunga; but these beds are not met with in the river section until a point is reached one and a half miles above the township. There is, therefore, a lateral displacement of the beds to this extent by the great dip fault.

The beds re-appear on the ridge road (which runs along the north side of the Onkaparinga), at the junction of a steep district road that follows down a gully and crosses the river at the Ford, between Sections 48 and 56. Here the two most important faults (B and C) of the district intersect. The limestone, which has been thrown a mile and a half east by the dip fault, is obliquely cut by another strike fault, running north-east and south-west. The paddock on the east side of the gully road is strongly ridged with limestone outcrops. The fault, with the limestone on its eastern side, crosses the gully road diagonally about half-way down to the river; and at a lower level the junction of the limestone, faulted against the purple slates, can be well studied, near the river level, on the western side of the road. The limestone shows discordant dips across its strike; but the general dip is towards the fault, viz., south-west at 40°; whilst the purple slates, which are greatly decomposed at and near the fault area, have a dip varying from 85° to 90° E. The limestone first dips to the fault, as stated, then east, 20° south, at 30° passing into a synclinal fold, which gives a reading of 70° west; whilst the underlying earthy beds, which rise on the eastern side, have a dip of 80° west. The limestone at the bottom of the valley has a spread of eighty yards.

The limestone crosses the Onkaparinga just east of the Ford, and skirts the southern rises of the river, on its left bank, going south. In the first gully below the Ford (Section 56) massive limestone outcrops make a prominent feature, and an excellent transverse section of the fault area is seen. (See Plate xliii., fig. 4.) The limestone is here exposed on both sides of the fault. On the west, or downthrow side, it forms a segment of an anticlinal curve, with a thick covering of purple slates, which fold over into the

Onkaparinga at 80°. On the east side of the fault the limestone dips east-south-east at 80°, being overlain by the siliceous limestones which dip in the same direction at 70°. The fault is, therefore, the result of an overthrust from the east, which has fractured the beds, and given a reversed position to the limestone, and placed the lower beds in a superior position.

The limestone has a strong outcrop as it passes over the hill into the next gully, to the south-west, where it has a dip west, 20° north, at 80°, and is cut out at the intersection of dip fault (D) with the main strike fault (C).

Still travelling south-west, two dip faults (the one just mentioned (D); and another (E), about 250 yards distant), run from the strike fault (C) in an easterly direction. The result is a downthrow, by which a wedge-shaped strip of purple slates is introduced, and cuts off the limestone beds both on the northern and southern sides of the strip.

Further strike faults are developed from each of the two dip faults just referred to. On the east side of the district road (which crosses the river at the Ford), and near the top of the hill on the southern side of the river, a strike fault (F) can be seen in a small gully which connects with Long Gully. This fault crosses the latter obliquely, and follows a line nearly parallel with the Onkaparinga. On the west side of the fault there are two small pockets of limestone. as outliers, preserved by a downthrow to the fault, one on either side of the valley. The southerly patch dips south, at 23°, with a roll to the south-east. The east side of the fault is occupied by purple slates which dip west, 10° north, at 38°. The fault plane is very strongly marked as it crosses another tributary, on the east side of the valley, near the mouth of Long Gully, with purple slates on one side, and the impure siliceous limestones on the other.

Parallel with the fault just described is another strike fault (G), about a quarter of a mile further to the east, which brings in the limestone once more at an angle of the creek. To the south the limestone is cut off by the dip fault (D), and, together with two repetitions of the same bed, is cut off on the north side by dip fault (I). Where the limestone crosses Long Gully the beds are vertical, whilst the purple slates, on the west side, dip west at 70°. The junction of the limestone with the purple slates, along the fault plane, is marked by a powerful spring which issues from the limestone in Long Gully, and yields a constant supply of running water in the creek, which is not affected by the seasons. This is an excellent illustration of a fault spring, the subterranean water in the calcareous beds on

the east side being thrown out to surface by the bar of purple slates on the western side.

A little further to the north, in Section 58, the limestone strikes diagonally between faults (F) and (G), and is cut off by each; and at the same time is intersected by a dip fault (H), which causes a lateral displacement of the bed.

The southern portions of this very disturbed field are determined, in their northern limits, by the important dip fault (E), which, with faults (C) and (D), makes an acute triangle of purple slates with a small isolated outlier of limestone, near the apex, on the eastern side. On the south side of fault (E) the limestone occurs in three distinct outcrops, each cut off by this fault on their northern side. The most westerly outcrop crosses a line of fence (Sections 63 and 64) near the head of a small gully. This outlier of limestone is cut by faults on three sides; the main strike fault (C), on the west; dip fault (E), on the north; and a second strike fault (J), which cuts it diagonally between faults (C) and (E). The limestone has an apparent dip of 65°, east-south-east, near its junction with the great strike fault, and as this makes the siliceous limestone occupy a superior position, it is probably a case of reversal of position, as seen in Section B (Plate xliii.), further to the north.

The small strike fault (J), which cuts the beds diagonally, has the effect of repeating the beds on the eastern side; so that on the rise of the hill the lower impure calcareous beds outcrop, with the main limestone both above and below them. The limestones have a trend towards the main fault (C), by which they are ultimately cut out in Section 19.

Following the line of (E) fault, in an easterly direction, it is obscured by cultivated ground, derived from the weathering of the purple slates, until passing over a low rise, a little east of the four cross-ways on the district roads, the outcrops are once more strongly marked as we descend to Long Gully. On the south side of Section 65, and crossing the east-and-west road, there is another short length of good limestone. The effect of fault (E) is seen in its easterly extension in cutting off this outlier on the north, whilst the limestone is circumscribed by another fault (K), on the south. The beds nipped in between faults (E) and (K) have suffered a strong twist towards the north-east.

A further fault (L), in conjunction with fault (K), has brought in another wedge of purple slates, which displaces the calcareous beds in Sections 75 and 66.

The limestone in these respective outcrops shows the characteristic features of the bed. It is commonly, finely oolitic in structure, and in shades of pink, blue, white, or brown. In contact with the main faults it is much altered, passing into yellowish, dolomitic, and ferruginous rock, whilst in parts still preserving its oolitic structure. In places a distinct fault rock is developed, calcareo-siliceous and jaspery. The purple slates on the line of junction become yellow, laminated, calcareous, and kaolinised slates, much weathered. The fault planes are more or less marked by quartz veins, carbonate of iron, and nodular brown ironstone.

There are no doubt other minor faultings in this field, not clearly defined, but suggested by the stratigraphical features that prevail.

Siliceous and Earthy Limestones and Calcareous Shales. These beds directly underlie the main limestone, and are of much greater thickness. They exhibit in the Onkaparinga district the same wavy and vermiculate structure which characterises the corresponding beds further north. Throughout the district they participate in the same general displacements as have occurred with the main limestone which immediately overlies them.

From the Field River they can be clearly followed through the township of Reynella; but southward of that township, at Morphett Vale, and extending beyond Hackham Post-Office, they are for the most part obscured by a thick cover of tertiary beds.

A little south of Hackham, in Section 32, an old quarry face is seen on the east side of the road, near the top of the rise. The stone is a siliceous banded limestone, with characteristic structure, having an exposed vertical face of about 15 feet, dipping east-south-east, at 15°. On the eastern side, the siliceous limestone is obscured by Miocene sands; but the former rapidly widens to the southward, and spreads out into a series of beds, measuring a quarter of a mile across the strike.

At Hackham main limestone quarry the siliceous limestones are seen to occupy the rise of the hill above the limestone; whilst on the low side of the hill they are also seen to underlie the limestone, which is their normal position. The respective dips of the main limestone and the impure calcareous beds which outcrop on its eastern side are discordant; the limestone dipping east-south-east, at a low angle, and the impure calcareous series, south-west, at 35°. On the north-and-south district road, near the eastern limits of the outcrop, the dip of the last-named beds is reversed to south-east, at 33°. This repetition of the impure calcareous

series, so as to outcrop on both sides of the limestone, together with collateral evidence, proves the existence of the important strike fault (A), already described.

At the head of the gully road (going down to the ford of the river), the beds displaced by the fault (B) are cut diagonally by the strike fault (C). At this point the impure limestones, underlying the main limestone, form a small triangular patch on the east side of the fault, but are cut out, about one-third distance down the hill towards the river. They occupy most of the ground bounded by the faults (C), (D), and (F), and can be well studied in the gorge of the river and its tributaries within the space named. Where they are cut by the fault (F), in Long Gully, the beds are strongly banded, and dip south-east, at 10°. Towards the mouth of Long Gully the dip changes to north-west, at 30°, and then increases to 65°-70°, with wavy and vermiculate structure strongly shown at the junction of the creek with the Onkaparinga.

Higher up Long Gully, near the east-and-west district road, these beds have a great spread on both sides of the creek. On the west side the beds are intersected by several faults, and make a sudden curve to the east; whilst on the east they occupy the entire space stretching to the Onkaparinga.

From the first appearance of these siliceous and earthy limestones in the bed of the Onkaparinga, near the Ford, they continue to form the cliffs of the river for more than a mile, measured in a straight line up the stream. Immediately underlying the main limestone, are very siliceous and earthy beds, which dip west, at 73°, and are thrown into acute anticlinal and synclinal folds, reaching high angles, from 55° to 70°, as far as the outlet of Long Gully, in Section 57, where the beds are more calcareous. On the eastern side of this tributary the dip is 45° east, passing into a syncline at low angle. The turn of the river to the northwards, in Section 49, makes its course almost co-incident with the strike of the beds, until the river bends in a north-east direction, and at the curve the beds are seen to be vertical. The dip then passes to the south-west and then to the south-east, in rolling curves of about 20°, in Section 50.

In Sections 43 and 51 the beds partake more of the character of banded calcareous slates, with a dip west, at 40°, and mark the passage from the siliceous limestones to the Tapley's Hill slates, although the transition is gradual, and by no means strongly marked. The cleavage planes are almost at right angles to the bedding, with a strike of 10° west of south. The dip of the beds increases, from the posi-

tion last referred to, reaching 53° in a direction south, 20° west. The dip of these banded shales preserves a consistent direction to some point between west and south-south-west. Half-way through Section 44 the "slates" weather on the bedding planes, and split into fine laminæ, whilst at the same time exhibiting cleavage planes. The dip is here towards the south-south-west, at 28°, but within a short distance the dip becomes 76° west, and the bedding planes are extremely wavy and finely contorted. At the beginning of Section 857 the beds assume an almost horizontal position, and then are reversed to south-south-east, at 20°. They roll, in gentle curves, for a short distance, and then pass out of sight under the Glacial (Cambrian) Till, with a dip of 30° in the direction last named. The junction of these beds occurs between Sections 857 and 856, at a point in the river where two small tributaries, one on either side of the valley, enter at right angles to the main stream. This occurrence of the till, in a position superior to the Tapley's Hill slates, is manifestly a reversal in which the older beds have broken through and slid over the newer in a thrust plane of a quarter of a mile exposure. The entire plane of displacement cannot be estimated, but a mile higher up the stream the base of the glacial beds is seen to rest in a normal manner on the laminated quartzites in the true order of succession.

V. Southern Extension of the Calcareous Series.

It has already been stated that, in Section 75, the beds are cut off by a dip fault. From this point southwards, along the strike of the beds, the country is largely covered with tertiary deposits of loose sand, ferruginous sand, grits, and gravels, which almost entirely mask the older beds. That these tertiary deposits include the marine Eocenes, in some localities, is proved by characteristic fossils of this age being found on cultivated ground belonging to Mr. A. Oliver, of Taranga Farm, situated one and a half miles north of Bellevue. Stones carrying numerous casts of *Turritella aldingæ* are turned up by the plough, and have been in sufficient quantity to supply the material for building the farm house.

Notwithstanding the blinding of the older rocks by these superficial deposits, the Cambrian limestone outcrops in Mr. W. Oliver's vineyard (Section 85). The stone is a good, strong limestone, and has been used for building a very substantial house on the grounds.

The eastern limits of outcrop of these calcareous beds passes a little west of Bellevue. In the creek behind Bellevue, earthy shales are exposed in a low face, with a dip east-south-east, at 45°. The western limits of the calcareous belt,

at this point, can be found on Mr. Philip Seaman's farm, adjoining the Willunga main road, with a quarry on Section 102, where the stone is a massive, blue, calcareous shale, slightly banded and penetrated with veins of white calcite. The dip is here 15° south-west. Following down the creek, in the sides of which the quarry is situated, at a distance of three-quarters of a mile (in Section 122), near a grove of almond trees, the limestone has again been slightly quarried for building purposes. The general dip is like the preceding one, 15° south-west, but the quarry face shows a sharp monoclinal fold, which throws the beds down, for a distance of about three feet, at an angle of 45°, when they again resume the lower angle of dip.

About half a mile lower down the creek (Section 131) the western limits of the calcareous belt is clearly defined by the junction of massive quartzites and purple slates, seen in Pedlar's Creek. From Pedlar's Creek the beds become more shaley, and are exposed in rough, serrated outcrops, the strike having a south-westerly trend, and no evidence of good limestone across their strike. About half a mile from the creek, following the strike, they pass under deep cultivated ground and sandy country, but pieces of travertine can be seen in the soil in the direction of the strike, for about a mile, or even more, from the last occurrence of the rock *in situ*.

The calcareous series, including both the good limestone and impure calcareous beds, gradually decrease in breadth in their southerly extension from the Onkaparinga, until in Section 170, a distance of five and a half miles south of the river, they are only a few hundreds of yards wide, and are also more earthy in composition, features which seem to indicate that the calcareous beds may die out in their south-westerly strike.

DESCRIPTIONS OF PLATES.

Plate XXXVII.

Great anticlinal fold in earthy, silicious limestones. Field River. Height of face, about 150 ft.

Plate XXXVIII.

Thin quartzite beds in purple slates, showing inverted fold. Field River.

Plate XXXIX.

Greatly contorted purple slates and thin quartzites. Curlew Point (north side), Gulf St. Vincent.

Plate XL.

A nearer view of part of the preceding section at Curlew Point (north side).

PLATE XLI.

Contorted rocks of the same series, on the south side of Curlew Point.

PLATE XLII.

Contorted rocks, on the same strike as the preceding, situated one-eighth mile north of Curlew Point.

PLATE XLIII.

Fig. 1. Section in Field River, from South Road to Hallett's Cove. Length, $3\frac{1}{2}$ miles.

Fig. 2. Section in the Onkaparinga River, from the Horseshoe (Noarlunga) to the outcrop of the older glacial beds. Length, $4\frac{1}{2}$ miles.

Fig. 3. Section A, as shown on map, from South Road to Long Gully. Length, $1\frac{3}{4}$ miles.

Fig. 4. Section B, in first gully below the Ford.

PLATE XLIV.

Geological map of the Lower Onkaparinga.

Further Notes on Australian Coleoptera, with Descriptions of New Genera and Species.

By the Rev. T. Blackburn, B.A.

[Read October 4, 1904.]

XXXIV.

LAMELLICORNES.

TROGIDES.

These insects form the sixth of the seven "tribes" into which Lacordaire divided the first of his main divisions of the *Lamellicornes*. He separated that tribe from all the others on the ground of there being only five ventral segments in the abdomen of the insects that compose it. The tribe is widely spread over the world, but not rich in *genera*. Its members are for the most part scavengers, feeding upon offal of all kinds, and therefore are, on the whole, to be regarded as useful to mankind. As might be expected from their habits, the species are easily disseminated from one land to another, and some of them have become cosmopolitan. In the following pages I have to record the occurrence in Australia of a species (not previously recorded in Australia) whose home is in Europe.

Five genera of *Trogides* have been recorded as Australian —*Megalotrox*, *Trox*, *Liparochrus*, *Antiochrus*, and *Acanthocerus*. The last named is distinguished from the four others by its body being contractile. Its place in the Australian catalogue rests on the foundation of a single species (*A. spinicornis)*, described by Fabricius, who, however, does not seem to have been very confident as to its *habitat*. I have never seen any Australian *Acanthocerus*, and am not aware of any reliable authority for attributing *A. spinicornis* to this continent. Consequently I have nothing definite to say about it. The validity of one of the remaining *genera (Antiochrus)* has been challenged by the Baron de Harold, who considers it identical with *Liparochrus*, but it appears to me to be very satisfactorily distinct, and I have therefore retained the name. *Megalotrox* differs from the normal structure of *Trox* in the great size of its hitherto described species, in its being apterous (with elytra soldered together), in its small scutellum deeply sunk in the base of the elytra, in the wide epipleuræ of its elytra, in its short metasternum. Nevertheless I am in doubt of the generic validity of this aggregate on account of the presence in my collection of a specimen from Tasmania which is intermediate between it

and ordinary species of *Trox*. The specimen in question is comparatively small (Long. 7 l.), and has elytra not soldered together and wings (short ones, as far as I can see), but presents all the other characters mentioned above as those of *Megalotrox*. It may be noted that Lacordaire states that in his opinion the presence or absence of wings has no importance in *Trox*. Under these circumstances, if *Megalotrox* is to stand as a good genus, another new generic name will be required for my Tasmanian specimen; but as the latter distinctly connects *Megalotrox* with *Trox*, and it is probable that other intermediate forms will yet be discovered, it seems better for the present to regard *Megalotrox* as a subgenus. For the present, at any rate, then, I am not satisfied that Australia possesses more than three valid genera of *Trogides*, viz., *Trox*, *Liparochrus*, and *Antiochrus*, which can be distinguished as follows:—

A. Antennal club normally lamelliform ... Trox.
AA. Basal joint of antennal club subcupuliform.
  B. Elytra normally striate ... ... Liparochus.
  BB. Elytral with a wide lateral margin which is closely striate, in contrast with the general surface ... ... Antiochrus.

N.B.—I ought to add here that I have not seen the type of *Antiochrus*, which is presumably in Europe, but have identified it from Dr. Sharp's description, so that there is a bare possibility of my identification being incorrect.

TROX.

This genus is very widely distributed over the earth, and some of its species have been introduced into so many lands that they have become more or less cosmopolitan. Lacordaire says that America is the continent where *Trox* is most plentiful. Species found in Australia have been described under 34 names, 7 of which I believe to be merely synonyms or names which are incapable of being referred to any particular species. These are discussed below. In the following pages I purpose supplying a tabulation of the distinctive characters of the known Australian *Troges*, together with some notes on synonymy, etc., a note on an introduced species, and descriptions of 6 new species. A certain number of the names are connected with descriptions so brief or vague as to be practically useless. These are all, I think, from the pens of Mr. W. S. Macleay and Sir W. Macleay, and it would be of little advantage to furnish a revision of the genus without giving some account of these difficulties, which I am the better able to do, as an opportune need for visiting Sydney has enabled me to spend a couple of days in studying the *Trogidæ* of the "Australian" and "Macleay"

Museums. Unfortunately, the results of that visit are unsatisfactory for the Macleayan species, as I find that the types do not bear tickets enabling them to be identified. In both Museums each name is written, together with a mention of the *habitat*, on a slip of paper laid on the surface of the cabinet drawer, into which slip are pinned all the specimens supposed to be of that species, the individual specimens being without separate tickets. I now proceed to supply information regarding the separate species, and regarding some others that seem to call for remark.

T. alternans, W. S. Macl. There is no specimen in either of the Sydney Museums bearing this name, and Mr. Masters is satisfied that the type is not in existence. Harold, without giving his reasons, assumes it to have been the insect which Erichson described as *T. Australasiæ*, and consequently drops *Australasiæ* as the later name. It, however, appears to me quite indefensible to sink a name connected with a good (and easily identified) description in favour of a name connected with a description that might be founded on any one of a considerable number of species, unless it be definitely stated that the change is founded on an examination of the original type. I shall, therefore, treat *T. alternans*, W. S. Macl., as non-existent.

T. subcarinatus, Macl. In the Australian Museum two specimens stand pinned into this name. One of them is the species that Harold subsequently described as *T. fenestratus;* the other is so covered with accretion that it is impossible to identify it with certainty, but I think it is *T. Crotchi*, Har. In the Macleay Museum also two specimens are similarly attributed to the name, one of which is *T. fenestratus*, Har.; the other, *T. candidus*, Har. The last named is evidently not the type, as it is notably smaller than the specimen that Macleay described. *T. subcarinatus*, Macl., is, therefore, identical with either *fenestratus*, Har., or *Crotchi*, Har. The description of *subcarinatus* does not supply information to decide the matter, although it appears to me to point to *Crotchi*, as it seems unlikely that if it had been founded on the same species as *fenestratus* the nitid spaces on the elytra would have escaped notice. I am afraid, however, that there is not sufficient evidence to justify the sinking of either of Harold's names, and that it is the name *subcarinatus* which must be dropped. It may be well to remark here that the *Trox* which Harold described as *subcarinatus*, Macl., is not that species, but *squamosus*, Macl.

T. alatus, Macl. There are two specimens thus named in the Macleay Museum. They represent a very remarkable and isolated species, notable by the great width of the pro-

thorax (almost twice as wide as long), by the sides of the pronotum extremely flat and dilated, by the reduction of all the carinæ of the pronotum except the middle two to mere small tubercles, by the third and fifth systematic series of the elytra being entire carinæ, by the all but absolute disappearance of the median external tooth of the front tibiæ and by the strong free projection hindward of the prosternal process.

T. asperatus, Macl.—Two specimens stand in the Macleay Museum as this species. They both appertain to the species that Harold named *Crotchi*. The latter is the older name.

T. dilaticollis, Macl. Two specimens in the Macleay Museum bear this name. They represent a species closely allied to *T. Augustæ*, Blackb., but differing from it in having on its elytra well-defined rows of small setose tubercles (scarcely less defined than those of *T. fenestratus*, Har.).

T. asperrimus, Macl. Two specimens in the Macleay Museum are pinned into the ticket bearing this name. I cannot find any difference between them and the specimens (from the same locality) pinned into the next label (bearing the name *vitreomaculatus*) except that the two of the former name are more deeply covered with the indumentum usually obscuring the sculpture of these insects, and therefore seem to have less defined carinæ on the pronotum, etc. As the name *asperrimus* is evidently founded on the presence of the indumentum and *vitreomaculatus* is a good descriptive name I propose retaining the latter, the two being of same date.

T. salebrosus, Macl. Two specimens in the Australian Museum and one specimen in the Macleay Museum stand as this species. One of them has the carinæ of its pronotum blunter than the corresponding carinæ in the two others, and there is some variation in the brilliance and conspicuousness of the nitid spaces on the elytra (which, however, might not be the case if the specimens were effectually cleaned). I am unable to find any good character distinguishing them from *vitreomaculatus*, Macl., and I consider them identical with that species.

T. semicostatus, Macl. Two specimens attributed to this name are in each of the Sydney Museums. The species is a very distinct one, allied to *Crotchi*, Har., but very much smaller, and having all the alternate elytral series continuously costiform in their basal half.

T. nodicollis, Macl. Two specimens pinned into the ticket bearing this name in the Macleay Museum are somewhat closely allied to *fenestratus*, Har., but, *inter alia*, are much smaller and have the intervals between the systematic series of the elytra much more roughly sculptured.

T. Castelnaui, Lansb. This, I have no doubt, is a mere variety of *gigas*, Har. No distinctive character is mentioned in the description that appears to me at all likely to be specific.

T. Tatei, Blackb. This insect was originally described as possibly a variety of *gigas*, Har. Subsequently to my publication of the name I have identified the true *gigas*, and find that it is perfectly distinct. As I did not describe *T. Tatei* as a species, I include it among the species to be described below.

T. carinatus, Har. Its author states that this insect is a variety of *T. Australasiæ*, Er.

T. squamosus, Macl. This name is represented by two specimens in each of the Sydney museums. They are the species which Harold called *T. subcarinatus*, Macl.

T. Australasiæ, Germ (nec. Er.). Germar's brief description under this name is not sufficient for its confident identification, but there can be little doubt of its having been founded on *T. litigiosus*, Har., which is plentiful in the locality where Germar's specimen was found, whereas *T. Australasiæ* Er., does not, so far as I know, occur there.

Before passing to the tabulation of the distinctive characters of the Australian species of *Trox* it seems desirable to offer some general remarks on the specific value of some of those characters, and on some of the terms that I have used to indicate them. The Australian species of *Trox* are remarkably variable in respect of some of their superficially most conspicuous features, but very constant in respect of certain others. Like most strongly tuberculated *Coleoptera* the development of the tubercles is decidedly variable, specimens being very often met with in which the tubercles are not identical on the two elytra, *e.g.*, there are often two rows cariniform at the base on one elytron, and only one on the other; often a cariniform basal part of a series is much longer on one elytron than on the other. The external teeth of the front tibiæ are variable in number, specimens being frequent in which the number is different on the right and left tibiæ. Each species certainly seems to me to have a *normal* number of teeth—1, 2, 3, or more—and I do not find that variation tends to default but only to *excess* of teeth, but it is certainly not at all rare in this respect. The structure of the prosternum behind the coxæ is certainly variable, though not frequently so. I have examples before me of several species having the middle of the prosternum normally produced in a small angle behind the coxæ, in which this angle is quite wanting. It must further be noted that the Australian species of *Trox* are liable to a remarkable blunting of the sharper prominences of their structure. Whether this

is due to imperfect development or to some attrition to which the parts in question have been exposed by the habits of the insects I cannot say, but it is certain that specimens are frequent in which sharp teeth on the tibiæ are represented by mere blunt sinuosities, and sharp carinæ on the pronotum and conical tubercles on the elytra are represented by corresponding blunt elevations having all the appearance of having been rubbed down. Perhaps it may be thought that I may be in error in regarding these variations as non-specific, but I can say positively that they are so, as I have found them in varying degrees in specimens differing in no other way and taken in company. All the above characters have been treated as specific in most of the published descriptions of these insects, doubtless through the descriptions having been founded on the inspection of only one or two specimens, and doubtless they are specific if regarded merely as indicating the *normal* characters, but they are clearly not available for reliable identification of the species.

The following characters I have found invariable, and as I have examined large numbers of specimens of some species they must at any rate be only very rarely variable:—The setulose vestiture, the texture of the inequalities of the surface (whether glabrous and nitid, or more or less setiferous, or more or less punctulate, or of an apparently spongiose tissue), the relation of the subsutural carina of each elytron to a short basal carina which borders the external margin of the scutellum; in some species the latter is straight and altogether disconnected from the former, in others the former is bent outward at the apex of the scutellum and runs forward in a curve to meet the latter (it must be noted that the subsutural carina, so-called, is not always a continuous carina, but may be broken into short pieces not quite touching each other), the general disposition of the elytral tubercles. Regarding this last-named character it is to be observed that it is quite distinct from the question of the size and shape of individual tubercles, or the extent to which this and that tubercle are run together into a short carina (which, as noted above, are very variable). To make this clear it is necessary to adopt a name for the tubercular series of the elytra. If an elytron of almost any Australian *Trox* be examined there will be seen ten longitudinal ridges of some kind; in almost all the species they are more or less tuberculiferous, and may or may not be the intervals between defined striæ; the first of them is close to the suture (I have called it the subsutural carina), the third is almost always, and the fifth is frequently, a narrow, continuous carina in its basal part. These ten ridges I have called the "systematic series," in Latin "series normales." In many

species there are also numerous small granules or large punctures, either without order or in sinuous or straight rows, interspersed among the systematic series, but in no case known to me capable, on careful inspection, of confusion with the latter. In a single species (*T. Brucki*, Har.) some of the systematic series are wanting, in a few species the systematic series are all similar *inter se*, in most of the species they (especially their tubercles) are alternately larger and smaller. Among these, the second, fourth, etc., series are the larger in some species, the third, fifth, etc., in other species. In these elytral characters I have found no tendency to variation. An invariable specific character is to be found also in the degree of declivity of the antero-lateral part of the elytra connected with the comparative prominence and shape of the humeral callus and the development of the front part of the sublateral systematic series; but these characters are difficult to express in words, though easy to appreciate when specimens are examined. To this extent, however, the character just mentioned can be used with advantage; if a *Trox* be looked down upon from exactly above it (so that the two lateral margins appear symmetrical) in some species (the less convex ones) the whole of the actual margin is visible on both sides as an even line, but in others its front part, from the point of view indicated, appears on both sides interrupted by its own deflexion or by the protrusion (beyond its outline) of the outline of the humeral callus or of the tubercles of the sublateral or lateral systematic series.

I should add that I have not found very satisfactory characters in the prothorax. The sinuosity of the margins of that segment is extremely variable within the limits of a species, as also the sharpness of the sculpture of the pronotum. Undoubtedly there are species in which the normal condition of the lateral margins is strongly and others in which it is feebly (or not) trisinuate, species in which normally the hind angles are well developed, and others in which they are normally more obtuse; but I have not succeeded in discerning any really workable distinction in these characters in more than two or three species. The greater or less declivity hindward of the part of the pronotum in front of the basal lobe seems to be a character calling for attention in identifying species.

Attention must be called to the fact that it is impossible to form a correct idea of the sculpture of a *Trox* without the removal of the indumentum, with which almost all specimens are coated. This generally requires the use of a strong brush (such as a tooth-brush), which, fortunately, the hard texture of the body renders practicable without injury to the specimen.

Tabulation of the Known Australian Species of Trox.

A. Without wings for flying; elytra soldered together (Megalotrox).
- B. Lateral margins of elytra deeply serrate.
  - C. Projections of elytral margins blunt. Size moderate (long, about 10 l.) ... ... Dohrni, *Har.*
  - CC. Projections of elytral margins acute. Size much larger ... gigas, *Har.*
- BB. Lateral margins of elytra (at most) lightly crenulate.
  - C. Head very closely (almost confluently) punctulate ... ... Elderi, *Blackb.*
  - CC. Head sparsely punctulate ... Tatei, *Blackb.*

AA. Winged; elytra not soldered together (Trox).
- B. Epipleuræ of elytra much wider than in the following species ... tasmanicus, *Blackb.*
- BB. Epipleuræ of elytra comparatively narrow.
  - C. The middle two carinæ of pronotum conspicuously abbreviated behind.
    - D. Elytra with about 20 conspicuous lines of short, bright fulvous setæ.
      - E. The elytral setæ fasciculated on the prominences of the systematic series.
        - F. The prominences of the systematic series of the elytra are scarcely marked ... ... Augustæ, *Blackb.*
        - FF. The prominences of the systematic series well defined ((almost as in *T. fenestratus*, Har.) ... dilaticollis, *Macl.*
      - EE. Elytral setæ evenly distributed (nowhere fasciculated), and notably longer than in "E" ... ... setosipennis, *Blackb.*
    - DD. Elytra not as in D.
      - E. Elytral tubercles (unless at their extreme apex) nitid, glabrous, and punctureless.
        - F. Subsutural carina of elytra continues along sides of scutellum and inner part of elytral base.
          - G. Lateral margins of prothorax crenulate (form of body very wide, tending to sub-circular) ... ... eremita, *Blackb.*

GG. Lateral margins of prothorax not crenulate (form of body much more ovate) ... Crotchi, *Har.*

FF. Subsutural carina of elytra not continuous with the short carina on either side of scutellum.

G. The elytral prominences of largest area are in 3rd, 5th, etc., systematic series.

H. 3rd, 5th, and 7th systematic series of elytra costiform in about their basal half (size small) ... ... semicostatus, *Macl.*

HH. Systematic series of elytra very little costiform.

I. Subapical external tooth of front tibiæ much smaller than apical tooth ... eyrensis, *Blackb.*

II. Subapical external tooth of front tibia about same size as apical tooth ... quadridens, *Blackb.*

III. Subapical external tooth of front tibia all but non-existent alatus, *Macl.*

GG. The elytral prominences of largest area are in the 2nd, 4th, etc., systematic series.

H. Hind tibiæ normal . . stellatus, *Har.*

HH. Hind tibiæ strongly incurved in their apical part ... . . curvipes, *Har.*

EE. Most (or all) of the elytral tubercles entirely (or nearly so) spongiose or setulose or punctulate.

F. Lateral margins of elytra in front part (viewed from above, and so that both are seen symmetrically) form an even line.

G. Subsutural carina of elytra continues along sides of scutellum and inner part of elytral base.

H. The alternate systematic series of the elytra very different from the others.

I. All the systematic series of the elytra tuberculiferous.

J. Two distinct rows of well-defined punctures between 1st and 3rd systematic series ... ... fenestratus, *Har.*

JJ. Space between 1st and 3rd systematic series occupied by confused rugulosity nodicollis, *Macl.*

II. Alternate systematic series devoid of tubercles ... Brucki, *Har.*

HH. All the systematic series of the elytra similar (or nearly so) *inter se.*

I. Lateral margin of elytra narrow and subvertical ... velutinus, *Blackb.*

II. Lateral margin of elytra wider and flattened (as in *litigiosus*, Har.) ... insignicollis, *Blackb.*

GG. Subsutural carina of elytra not continuous with the short carina on either side of scutellum.

H. Size moderate or large ($5\frac{1}{2}$ l, or more).

I. Subapical callus of elytra quite strongly prominent (both externally and internally) and bearing two of the largest tubercles of the elytra ... litigiosus, *Har.*

II. Subapical callus of elytra but little prominent, and bearing comparatively small tubercles.

J. The elytral tubercles of largest area are on 2nd, 4th, etc., systematic series, and are nitid ... strzeleckianus, *Blackb.*

JJ. Elytral tubercles not as in J.

K. Elytra not having conspicuous nitid black spaces.

L. Apical dilatation of front tibiæ bifid euclensis, *Blackb.*

LL. Apical dilatation of front tibiæ entire ...	mentitor, *Blackb.*
KK. Elytra having numerous conspicuous nitid black spaces	tricolor, *Blackb.*
HH. Size very small (4 l. or less)	vitreomaculatus, *Macl.*
FF. Lateral margins of elytra in front part (viewed from above) interrupted by projection of humeral callus or of tubercles	
G. Intermediate and hind tibiæ unarmed or finely crenulate, externally.	
H. Prothorax very evidently at its widest considerably in front of middle	squamosus, *Macl.*
HH. Prothorax at its widest at, or behind, the middle.	
I. Tubercles of elytra unusually few in number and large	Australasiæ, *Er.*
II. Tubercles of elytra much more numerous and smaller	candidus, *Har.*
GG. Intermediate and hind tibiæ with some conspicuous, well-defined external teeth ...	perhispidus, *Blackb.*
CC. Middle two keels of pronotum not definitely abbreviated behind.	
D. Antennal club dark; form wide and rounded; long. 4 l.	sabulosus, *Fab.*
DD. Antennal club lighter; form narrow and parallel; long. 3 l.	scaber, *Illig.*

T. (Megalotrox) Tatei, Blackb. Late ovalis; sat convexus; niger; capite sparsim fortiter punctulato transversim obtuse nec alte carinato; prothorace quam longiori ut 6 ad 4 latiori, postice lobato, supra costis tuberculisque crassis inæquali, sparsim punctulato (partibus lateralibus crebre granulatis), postice quam antice ut 13 ad 8 latiori, angulis posticis subrectis, lateribus arcuatis crenulatis; elytis confuse granulatis et tuberculorum magnorum obtusorum seriebus 3 (et tuberculorum multo minorum serie subsuturali) ornatis, lateribus subtiliter crenulatis; tibiis anticis extus tridentatis, dente apicali bifido. Long., 13 l.; lat., 8 l (vix).

At once distinguishable from the other *Troges* of the section *Megalotrox*, except *Elderi*, Blackb., by the lateral margins of its elytra being only finely crenulate, and from *Elderi* by its much narrower and more convex form, its much less transverse prothorax, its much more sparsely punctured and more uneven head, and its pronotum much less closely punctured and having much thicker carinæ and tubercles, which are, indeed, so wide that there can scarcely be said to be any distinct flat intervals between them, whereas in *Elderi* the prominences on the pronotum are narrow and separated from each other by wide, flat intervals.

S.W. parts of South Australia.

T. tasmanicus, sp. nov. Alatus; minus late ovatus; fere glaber; minus nitidus; niger; capite ruguloso-punctulato, fronte bituberculata; prothorace quam longiori ut 8 ad 5 latiori, supra fere ut caput punctulato, longitudinaliter carinis 6 nitidis fortiter elevatis instructo (carinis medianis 2 sinuatis postice fortiter abbreviatis, intermediis fortiter sinuatis in medio interruptis, externis interruptis et in dimidio pronoti antico carentibus), ad latera late explanato, margine laterali sat æqualiter arcuato incrassato grosse punctulato, angulis omnibus obtusis, basi latissime rotundatim modice fortiter lobata; scutello minori, depresso; elytris valde inæqualibus, serierum normalium tuberculis nitidis (nonnullis sat grosse punctulatis) 1^æ^ parvis (haud cum carina scutellari continuis) 3^æ^ 5^æ^ 7^æ^ que magnis (serie 3^a^ ad basin breviter cariniformi) 9^æ^ parvis ceterarum granuliformibus cum granulis aliis inæqualiter commixtis, marginibus lateralibus totis sat fortiter serratis, epipleuris perlatis nitidis minute granuliferis; metasterno brevi; tibiis anticis extus inermibus, posterioribus 4, crenulatis, prosterno pone coxas subtruncato. Long., 7 l.; lat., $4\frac{1}{5}$ l.

The only winged Australian species yet described or known to me having the broad elytral epipleuræ and short metasternum of the large species for which M. de Borre proposed the name *Megalotrox*.

Tasmania.

T. setosipennis, sp. nov. Alatus: minus late ovatus; minus opacus; niger vel piceus vel rufo-piceus, antennarum clava rufa; supra setis subtilibus læte fulvis (in pronoto quam in elytris magis brevibus, in his ut series circiter 20 sat regulares dispositis nec in ulla parte fasciculatis) vestitus; subtus partibus nonnullis rufo ciliatis; capite puncturis setiferis sat grossis nec crebre nec fortiter impresso, fronte bituberculata; prothorace quam

longiori ut 13 ad 8 latiori, supra fere ut caput punctulato sed paullo magis fortiter, fere ut *T. tasmanici*, Blackb., carinato sed carinis obtusis multo minus elevatis, ante lobum basalem medianum sat fortiter declivi, margine laterali fortiter trisinuato, angulis anticis sat obtusis posticis sat acute rectis, basi utrinque profunde late emarginata (lobo mediano triangulari); scutello modico lanciformi; elytris vix perspicue tuberculatis, seriebus normalibus 1ª 3ª, etc., obtuse leviter convexis 2ª 4ª, etc., sat planis sed pustulis magnis nitidis nonnullis vix elevatis ornatis, intervallis inter series normales longitudinaliter seriatim foveatis, seriebus ipsis longitudinaliter seriatim sat subtiliter punctulatis, serie 1ª antice haud ut carina ad scutelli latera continua, callo subapicali minus elevato; tibiis anticis extus bidentatis; prosterno medio pone coxas acuto minus producto. Long., 7 l.; lat., $3\frac{4}{5}$ l.

This species, *T. dilaticollis*, Macl., and *T. Augustæ*, Blackb., are easily distinguishable from all the other Australian species of *Trox* known to me by the numerous and conspicuous rows of fine, brightly fulvous setæ on their elytra. They resemble each other considerably, but are separated by good characters—the inequalities of the pronotum being in the other two species strong cariniform ridges, in this one feeble obtuse convexities: the subsutural carina of the elytra being in the other two continuous along the sides of the scutellum, in this species widely disconnected from the short elevation that margins the sides of the scutellum in their front part; the elytral setæ being very evidently shorter, less erect, in the other two than in this species, those setæ, moreover, in the other two not being regularly spaced (on account of two or three setæ being placed close together here and there as a fascicle on the apex of a scarcely defined tubercle), while in the present species each seta is isolated, and all are very equally separated *inter se*.

South Australia (Yorke's Peninsula).

T. eyrensis, sp. nov. Alatus; sat late ovatus; fere glaber; minus nitidus; niger, capite subtus et pedibus capillis nonnullis rufulis vestitis, antennarum clava rufa; capite sat crebre subfortiter vix rugulose punctulato, fronte bituberculata; prothorace quam longiori ut 13 ad 8 latiori, supra fere ut caput sed paullo magis rugulose punctulato, fere ut præcedentis *(T. tasmanici)* carinato, ad latera sat late explanato, ante lobum basalem medianum fortiter declivi, margine laterali ante medium haud vel leviter (pone medium leviter) sinuato, angulis anticis

nonnihil subacutis posticis subrectis, basi utrinque bisinuata (lobo mediano modico postice sat rotundato); scutello modico lanciformi; elytris tuberculato-inæqualibus, serierum normalium tuberculis nitidis lævibus (nonnullis postice ad apicem spongiosis) 3æ sat parvis 5æ 7æ 9æ gradatim magis parvis ceterarum granuliformibus, granulis minutis (vel puncturis) inter series normales lineatim sinuatim dispositis, serie 3a breviter (5a haud vel vix) ad basin cariniformi, 1a ad basin haud ut carina ad scutelli latera continua, callo subapicali minus perspicuo; tibiis anticis extus dentibus 3 bene definitis armatis (dente apicali quam alii multo majori); prosterno medio pone coxas minute acuto. Long., 6½ l.; lat., 4 l.

The nitid punctureless tubercles of the systematic series on the elytra (some of them nevertheless being spongiose on a small area at the hinder part of their apex), together with the subsutural systematic series not at the base becoming cariniform and continuous along the sides of the scutellum, distinguish this species from all others bearing a general resemblance to it except *quadridens*, Blackb., which it closely resembles, though I am quite satisfied that the two are valid species. *Eyrensis* (which I have seen only from the south-west coast of Australia) has the sides of its prothorax evenly arched (rarely slightly sinuate), from the front nearly to the base, and then feebly sinuate, while in *quadridens* (which I have seen only from north of Port Augusta) the sides of the prothorax are quite strongly trilobed. There is also a reliable distinction in the armature of the front tibiæ. In both species those tibiæ have three or more external teeth (not rarely 4 on one tibiæ and three on the other), but in *quadridens* the subapical tooth is fully as large as the apical, while in *eyrensis* the apical tooth is very much larger than the others. I find also that the tubercles of the systematic series in *eyrensis* have much more spongiose tissue than in *quadridens*. In the latter, those tubercles are (as in *T. Crotchi*, Har.) all but absolutely without it; while in the former the postero-apical surface of most of them is distinctly opaque and spongiose, with the result that, looked at obliquely from behind, *eyrensis* might almost be referred to the *litigiosus* group of species, while regarded obliquely from in front scarcely any opacity can be seen on the tubercles. Apart from the different character of the tissue of its elytral tubercles *eyrensis* bears considerable general resemblance to the larger species of the *litigiosus* group. In other respects, however, it differs from them, *inter alia*, as follows:—From *litigiosus*, Har., by the more numerous external teeth of its

front tibiæ (I have not seen any *litigiosus*, in a long series, which has on both tibiæ more than two teeth; two is undoubtedly its normal number), by the much less prominence of the subapical calli of its elytra (these in *litigiosus* both are more prominent in themselves and also bear on the third systematic series a conspicuous tubercle scarcely smaller than the largest tubercle of that series), and by the distinctly red club of its antennæ; from *strzeleckensis*, Blackb., by the largest and most nitid elytral tubercles being on (not the second, fourth, etc., but) the first, third, etc., systematic series; and from *mentitor* Blackb., by the much larger and much less numerous tubercles of its elytra. *T. euclensis*, Blackb., and *vitreomaculatus*, Macl., hardly need to be differentiated, the former having *inter alia multa* nearly all its elytral tubercles almost entirely opaque, and the latter *inter alia multa* being one of the smallest Australian species of the genus.

South-east parts of Western Australia.

T. mentitor, Blackb. This species is closely allied to *T. euclensis*, Blackb., and difficult to separate by characters that lend themelves to tabulation. The character that I have selected for tabulation is very satisfactory if constant, but as *mentitor* continues unique I hesitate to place entire reliance upon it, though I find the bifidity of the apical dilatation of the front tibiæ constant in *euclensis* (of which I have examined many specimens). *T. mentitor* is a species of more parallel form than *euclensis*, and the tubercles of its elytral series are smaller and much more numerous and closely placed than the corresponding tubercles in *euclensis*, while the small granules of the interstices between the systematic series run (not in sinuous lines as they do in *euclensis*, but) in perfectly straight lines.

T. tricolor, sp. nov. Alatus; sat late ovalis; sat opacus; niger vel piceo-niger, palpis antennisque rufis; supra in elytris (areis numerosis nitidis aterrimis exceptis) pube subtilissima creberrima brunnea et setis brunneis cinereisque minus perspicuis (his in tuberculis subobsoletis fasciculatis) vestitus; subtus partibus nonnullis rufo-hirtis vel ciliatis; capite sparsim granulato-punctulato, fronte bituberculata; prothorace antice angustato, quam longiori ut 13 ad 9 latiori, supra ut caput granulato-punctulato (puncturis minute setiferis), fere ut *T. tasmanici*, Blackb., carinato sed carinis perobtusis, ante lobum basalem medianum haud abrupte declivi, margine laterali pone medium profunde emarginato, angulis anticis subacutis posticis subrectis, basi fortiter trisinuata, lobo basali postice angulato; scutello cordi-

formi; elytris inæqualibus, serierum normalium $1^{æ}$ $3^{æ}$ etc., tuberculis minus perspicuis (horum aliis nitidis, aliis opacis), serierum $2^{æ}$ $4^{æ}$, etc., tuberculis fere nullis, inter series normales (his basin versus vix cariniformibus) seriatim sat grosse punctulatis (nec granulatis), carina subsuturali ad basin haud ut carina ad scutelli latera continua, callo subapicali vix perspicuo; tibiis anticis extus bidentatis; prosterno medio pone coxas obtuse angulato. Long., 6 l.; lat., $3\frac{4}{5}$ l.

Owing to the feebleness of its sculpture, the place of this species in a tabulation is not very obvious without careful consideration. The nitid (and slightly elevated) spaces on the third, fifth, etc., systematic series are so much more conspicuous than the ill-defined pubescent tubercles between them that at first sight the latter (which are the true tubercles of the series) might almost be overlooked, and the subsutural carina is so nearly obsolete that it is not very satisfactory to have to attribute to it any character at all. But in all genera of numerous species such cases of difficulty are to be expected where characters that serve well for identifying most of the species are less available in the case of occasional feebly developed species. The second, fourth, etc., systematic series of the elytra are sub-obsolete, but not (as they are in *Brucki*, Har.) absolutely wanting. The species, however, is easy to recognise, if in good condition, by the peculiar colouring, on which I have founded the name. The elytra present the appearance of being chequered with patches of three colours: the nitid black squares in the alternate interstices, the dark brown derm, and the cinereous setæ on the tubercles that are alternated with the nitid black squares. Its structural characters also render *T. tricolor* incapable of confusion with any of its described Australian congeners, as it is the only one of those not having defined tubercles or granules in the second, fourth, etc., systematic series, having conspicuous nitid black spaces in the first, third, etc., series.

New South Wales. Taken near Sydney by Mr. Carter.

T. perhispidus, sp. nov. Alatus; sat late ovatus; sat opacus; niger vel piceo-niger, palpis antennisque (harum basi excepta) testaceis vel rufis; supra in elytris setis brevibus fulvis circiter 16 seriatim longitudinaliter ornatus (his in tuberculis fasciculatis) et in marginibus setis elongatis piliformibus ciliatus; subtus partibus nonnullis rufo-ciliatis; capite obscure nec crebre granulato, fronte bituberculata; prothorace quam longiori ut 3 ad 2 latiori, supra ut caput granulato (granulis minute fulvo-setiferis), fere ut *T. tasmanici*, Blackb., carinato sed carinis subobsoletis perobtusis,

ante lobum basalem medianum sat fortiter declivi, margine laterali vix sinuato, angulis anticis sat obtusis posticis fere (nec acute) rectis, basi utrinque profunde late emarginata, lobo basali lato postice rotundato; scutello sat lato sublanciformi; elytris tuberculato-inæqualibus, serierum normalium tuberculis modicis opacis (aliis elongatis, aliis subconicis), serierum 3æ 5æ 7æ 9æ tuberculis quam ceterarum majoribus, tuberculis setis fasciculatis brevibus ornatis, inter series normales granulis nonnullis setiferis instructis, seriebus 3a 5a que ad basin plus minusve cariniformibus (1a ad basin haud ut carina ad scutelli latera continua), callo subapicali vix perspicuo; tibiis anticis extus bidentatis, intermediis dentibus 2 prope mediam partem bene definitis et aliis nonnullis minoribus, posticis crenulatis; prosterno pone coxas late nec acute prominenti. Long., $4\frac{1}{2}$ l.; lat., $2\frac{1}{2}$ l.

This is an extremely distinct species, and cannot well be confused with any other Australian member of the genus. The sculpture of the middle tibiæ (consisting of two well-defined teeth about the middle of the external margin and smaller teeth above and below) in itself distinguishes it from all its known Australian congeners. Also the fringe of elongate, hair-like setæ on the lateral margins of the elytra are unusual, as well as the 16 longitudinal rows of setæ on each elytron, many of which setæ are fasciculate on tubercles in the first, fourth, seventh, tenth, and thirteenth rows (in the sixteenth they are somewhat obscure and confused with the long marginal setæ). Other unusual characters are the exceptional feebleness of the inequalities on the pronotum and the width of the scutellum. The species is in some respects suggestive of the European *T. hispidus*, Laich., but very distinct, *inter alia multa*, by the strong convexity of its pronotum, and the deep emargination of the base of that segment on either side, which is almost as in *T. Australasiæ*, Er. The strong convexity of the humeral callus and the strong projection of the tubercles of the ninth systematic series cause the true lateral margin of the elytra to be hidden in the front part, when the insect is looked down upon from above (from the point whence the two sides are seen symmetrically), so that the lateral margins from that point of view appear jagged, as in *candidus*, Har., and some other species.

Northern Territory of South Australia.

T. sabulosus, Fab. I have found an example of this European species among some Australian *Coleoptera*, given to me by Dr. Pulleine some years ago, and there is every reason to believe that it was taken somewhere near Adelaide.

ON THE ABSORPTION OF α RAYS, AND ON THE CLASSIFICATION OF THE α RAYS OF RADIUM.

By W. H. Bragg, M.A., Elder Professor of Mathematics and Physics in the University of Adelaide.

[Read September 6, 1904.]

Abstract.

In a paper read at the Dunedin meeting of the Australasian Association for the Advancement of Science, in January, 1904, the author had compared the phenomena attending the absorption of α and β rays, and had shown that the following hypotheses were probably true:—

(1) The β ray is "absorbed" as it penetrates matter from two causes—*(a)* deflection due to close encounter with electrons of the atoms traversed; *(b)* expenditure of energy on ionisation.

(2) The α ray is "absorbed" from the latter cause alone. It followed that the α particle moved through matter without deviation until its energy was expended; that no dispersion attended its flight; that it had a definite range, depending on its initial velocity; and that, like any atom moving with more than ionising speed, it must become positive—even though neutral at first—from collision with ions traversed and consequent loss of one electron.

The author now described a number of experiments in support of these hypotheses. The principle of the method employed consisted in the isolation of a narrow cone or cones of α rays by suitable stops, and the examination of the ionisation produced by them at different distances from their source. This was accomplished by the use of a shallow ionisation chamber. The experiments might be divided into two classes, those with thick layers of radium and those with thin layers. In the former case he showed that a curve in which the ordinates represented distances from radium to ionisation chamber, and the abscissæ currents as measured in a quadrant electrometer—and which he termed the ionisation curve—should be a rectilinear polygon, on the following assumptions:—

(a) All α particles produced ions in proportion merely to distance traversed.

(b) α particles lost energy in proportion to matter traversed, so that such as came from lower layers of radium would lose speed before emerging.

(*c*) Radium in a state of equilibrium contained its radio-active products, each ejecting an equal number of α particles of definite speed, and therefore responsible for one of the sides of the polygon.

He showed that experiment proved this to be the case. He also described the following experimental results:—(1) De-emanated radium only emitted α particles of range about 3·3 cm. (2) A uniform layer cut off the same quantity from the range of all the α rays.

In the case of thin layers he showed that the curve should take the form of a series of steps, each step representing one radio-active change, and that this also was an experimental fact. Experiments with thin layers showed that:—

(1) De-emanation removed all the steps but one, that of height 3·3 cm.

(2) Other three steps slowly came back into the curve, at about the proper rate, according to Rutherford and Soddy's theory of radio-active change. They had heights of about 4 cm., 4·5 cm., and 6·7 cm. respectively.

(3) These three were all nearly equal in width, implying that the number of α particles in each stream was the same, as it should be.

(4) A red heat temporarily removed the first two of these three steps, the third afterwards dying out. It therefore appeared that the third was due to the second radio-active product, the others being due to the first radio-active product and the emanation.

(5) The α particle ionised more successfully towards the end of its career.

The author also showed that in Becquerel's photographic trace of the path of the α ray in a magnetic field there should be—on at least one side of the trace—more curvature in the part of the curve near the radium than in the part further away; and that in this way Becquerel's observations to that effect might be explained. The outer edge was, in fact, the locus of the ends of the rays, not the path of any one ray.

It was more difficult to determine the precise positions of the corners of the polygon in the case of thick layers than the positions of the steps in the curve of thin layers. Experiments on the former, conducted with dome-shaped ionisation chambers of various radii, had met with some degree of success.

Mr. R. Kleeman had given valuable assistance during the research.

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia

(Incorporated)

FOR 1903-4.

ORDINARY MEETING, NOVEMBER 3, 1903.

JOSEPH C. VERCO, M.D., F.R.C.S. (President), in the chair.

EXHIBITS.—J. G. O. TEPPER, F.L.S., a sprig of *Pinus halipensis* covered with scale (*Chermes*, sp.) insect. This scale is extremely injurious to plant life. Unlike others of the same family, it occupies the extremities of the limbs first, and works downwards, producing top-drying, and ultimately death. Probably introduced from the East. Mr. TEPPER also exhibited a moth (*Doratifera oxleyi*), colour brown, male smaller than female. The caterpillar, before passing into the larval state, spins a very thin cocoon, which it stiffens by discharging into and saturating it with a thick, agglutinative fluid, finally cutting the silk to allow the escape of the matured moth. Mr. S. SMEATON, B.A., had seen this moth in the sugar gums of a brilliant colour; it is not eaten by birds. D. FLEMING, Chairman of the Microscopical Section, exhibited some young fish and eggs taken from the River Torrens.

PAPERS.—The Tate Memorial Medal Prize Essay:—"The Port Victor Granite," by H. W. Gartrell, communicated by W. G. WOOLNOUGH, B.Sc., F.G.S. "Description of Australian *Curculionidæ*, with Notes on Previously Described Species," Part ii., by A. M. LEA, Government Entomologist, Tasmania.

ORDINARY MEETING, DECEMBER 1, 1903.

JOSEPH C. VERCO, M.D., F.R.C.S. (President), in the chair.

PRESENT—Professor E. H. Rennie, D.Sc. (Vice-President), W. Rutt, C.E. (Hon. Treasurer), Dr. Cleland, W. Howchin, F.G.S. (Editor of the Transactions, etc.), Samuel Dixon, D. Fleming, W. H. Baker, H. Basedow, Miss E. Collison, B.Sc., and the Hon. Secretary.

Exhibits.—W. Howchin, F.G.S., the fruit, seed, and leaves of the Leichhardt tree, which had been brought down from beyond Tennant's Creek, Northern Territory, by H. Y. L. Brown, Government Geologist. D. Fleming, Chairman of the Microscopical Section, exhibited a Polyzoan, from the River Torrens *(Plumelella repens)*.

Disposal of the Library.—Professor Rennie, D.Sc., introduced the proposal to hand over the books and periodicals of the Society to the Board of Governors of the Public Library, etc., for the consideration of the meeting. It was then proposed by Dr. Cleland, seconded by D. Fleming, and carried unanimously—"That the Council of the Society be empowered to make arrangements with the Board of Governors of the Public Library, etc., to take over and keep for public use such portions of the Royal Society's Library as may be considered by the Council desirable, and hold under such terms as the Council may determine to be in the best interests of the members of the Society."

Nominations.—David Gordon, Warehouseman, Adelaide, and Howard Whitbread, Pharmacist, Adelaide, as Fellows.

Ordinary Meeting, April 7, 1904.

Joseph C. Verco, M.D., F.R.C.S. (President), in the chair.

Exhibits.—J. G. O. Tepper, F.L.S., a branch of lemon tree on which was growing a large parasitic plant *(Loranthus exocarpi)*. The specimen was collected by Mr. Fergusson, of the School of Mines, from a garden at Mitcham, and shows that this species of *Loranthus* grows on the *Citrus*. Mr. Zietz observed that the *Loranthus* readily grows on fruit trees Mr. Tepper also exhibited a case of insects, collected by Mr. H. Basedow, in the north-west part of South Australia. Some 445 specimens were obtained, and have been presented to the South Australian Museum by the collector. The identification of the *Coleoptera* has been undertaken by the Rev. Thomas Blackburn, B.A.; the *Lepidoptera* by Mr. Oswald B. Lower, F.E.S. (Lond.); whilst the identification of the *Orthoptera* and any other orders there may be in the collection has been undertaken by J. G. O. Tepper, F.L.S.

Ballot.—David Gordon and Howard Whitbread, both of Adelaide, elected as Fellows.

Papers.—"Recent Corals from the South Australian and Victorian Coasts," by John Dennant, F.G.S. W. Howchin, F.G.S., in bringing this paper before the meeting, remarked:—"Owing to the President's generosity the plates would cost the Society nothing, and that many of the corals described had been dredged by Dr. Verco." Mr. Howchin gave a preliminary and verbal account of the geological discoveries he had made during the late vacation. After illustrating on

the blackboard the general relative positions of the rocks in the Mount Lofty and Flinders Ranges, Mr. Howchin said he had ascertained that the formations, as shown in the section from Marino to Mount Lofty, were found generally in the same order in the Flinders Ranges, as far as examined. The series occupied the same relative position over the whole area. The highest member of the series, the purple slates, which included the archæocyathinæ limestones, occupied a superior position to the older glacial beds. The fossil remains in the limestone gave a datum for the whole formation. Mr. Howchin also described the geological features of Mount Remarkable, and explained how, in all probability, it came to possess so singular an outline. W. G. Woolnough, D.Sc., remarked that Mr. Howchin's discoveries would form the basis of future geological and mineralogical work. Professor W. H. Bragg, M.A., then gave an interesting account of his visit to New Zealand on the occasion of the meeting of the Australian Association for the Advancement of Science, held at Dunedin in January last. He mentioned, in the course of his address, that, owing to the meeting of the Medical Congress in Adelaide, in September, 1905, the meeting of the Australian Association for the Advancement of Science had been put off for a year. Professor Bragg also stated that his nomination of Professor Baldwin Spencer as the President of the meeting in Adelaide was well received, and was peculiarly appropriate, because much of Professor Spencer's work had been done in South Australia.

Nomination.—Dr. Reissmann, as a Fellow.

Ordinary Meeting, May 3, 1904.

Dr. Cleland in the chair.

Ballot.—C. Reissmann, M.A., M.D. (Cantab.), B.Sc. (Lond.), etc., elected a Fellow.

Exhibits.—Edwin Ashby gave an interesting account of a visit to the Blackall Ranges, Queensland, and exhibited 46 varieties of birds' skins which he had obtained in that locality; also a case of beautiful butterflies and some large land shells.

Ordinary Meeting, June 7, 1904.

Joseph C. Verco, M.D., F.R.C.S. (President), in the chair.

Exhibits.—J. G. O. Tepper, F.L.S., a small quantity of monazite, from the Northern Territory. This mineral consists of phosphate of thorium and other rare elements.

Ballot.—H. Griffith, of Adelaide, was elected a Fellow.

Nominations.—James Gartrell, William Taylor, and Mrs. H. R. Robinson.

Papers.—"Anthropological Observations made on the Government N.W. Expedition (Central Australia)," by H.

Basedow. Mr. Basedow exhibited a number of sketches of native rock paintings and photographs of groups of natives to illustrate his paper. "Descriptions of Some New Species of Orthoptera, collected during the Government N.W. Expedition (Central Australia)," by J. G. O. Tepper, F.L.S. Mr. Tepper exhibited a case of insects, being part of those collected during the expedition. "Descriptions of New Species of Australian *Elachistidæ*, etc.," by Oswald B. Lower, F.E.S. (Lond.).

Ordinary Meeting, July 5, 1904.

Joseph C. Verco, M.D., F.R.C.S. (President), in the chair.

Ballot.—William Taylor, St. Andrews, North Adelaide, and James Gartrell, of Burnside, were elected Fellows, and Mrs. H. R. Robinson, "Las Conchas," Largs Bay, was elected an Associate.

Exhibits.—Referring to the mineral monazite, a specimen of which had been exhibited at the last meeting, Mr. Zietz remarked that it was found in New South Wales. W. Howchin, F.G.S., exhibited a large and interesting collection of rock specimens and fossils from Lake Eyre district, together with native weapons and food products.

Papers.—"Note on South Australian Decapod Crustacea," Part i., by W. H. Baker. "Nudibranchiate Mollusca of South Australia," by H. Basedow. [This paper was subsequently withdrawn for reconstruction.] "Remarks on a Recent Visit to the Lake Eyre District," by W. Howchin, F.G.S. Mr. Howchin described the physical and geological contrasts in passing from the Cambrian rocks of the Flinders Range to the Cretaceous of the Lake Eyre basin. The desert sandstone country, the sandhills and claypans, the stony (gibber) deserts, and the mound springs were described, and received illustration by numerous exhibits. The most remarkable mound spring met with was one known as the "boiling spring," situated about a quarter of a mile distant from Blanche Cup. It takes its name, not from possessing a high temperature (which is not more than tepid), but from its boiling action, by which the quicksand rolls and twists and rises above the level of the water like a huge serpent. The extinct mound springs are immensely larger than those now active. Mount Hamilton, within a quarter of a mile of Blanche Cup, is one of these, and is sixty feet high and a half-mile in circumference. The mount is composed of compact dolomitic limestone, which was precipitated from the spring when active. Near the centre, on the top of the mount, there is a shallow depression, but no water. An old flint quarry that had been worked by the aboriginals for their stone implements was also described, and an old mulga

stick was shown, which the lecturer had found in the quarry, and had been used by the natives to prise up the flints from their bed. It had evidently been left by the last workers. The hill on which the quarry was situated, and which was covered with countless numbers of chippings, was near Pidleeomina Waterhole, thirty miles south-west from Stuart's Creek Station. Mr. Howchin also exhibited a number of large and roughly made stone implements, stained red, which he had obtained from the table top country. These implements were unlike those now used by the natives or commonly met with on the lower ground and sandhills of the country, and might possibly have belonged to an older race now extinct.

ORDINARY MEETING, AUGUST 2, 1904.

JOSEPH C. VERCO, M.D., F.R.C.S. (President), in the chair.

EXHIBITS.—A. H. C. ZIETZ, F.L.S., Assistant Director of the Museum, exhibited a fungus *(Polyphorus mylitta)*, found about three feet under ground, in wet, sandy soil, near gum trees, at Myponga. This fungus was formerly eaten by the natives. It grows to about the size of a football, and has the appearance of a large potato. It is found in New South Wales and Tasmania, but has not previously been recorded from South Australia. Mr. ZIETZ also exhibited a number of well-known birds from both northern and southern Australia, and two hybrids, one between *Platycercus barnardi* and *P. flaveolous*, from the Wirrabara Forest, and the other between *Geopelia tranquilla* and *G. striata*, bred in captivity.

PAPER.—"South Australian Marine Mollusca," by J. C. VERCO, M.D., F.R.C.S.

ORDINARY MEETING, SEPTEMBER 6, 1904.

JOSEPH C. VERCO, M.D., F.R.C.S. (President), in the chair.

BALLOT.—William Christie, of Adelaide, was elected a Fellow.

EXHIBITS.—O. B. LOWER, F.E.S. (Lond.), a pseudomorph cast of a shell *(natica)*, in opal, from White Cliffs. W. HOWCHIN, F.G.S., a number of rock specimens to illustrate his paper.

PAPERS.—"On the Alpha Rays of Radium," by Professor W. H. BRAGG, M.A. "Geology of the Mount Lofty Ranges: Part i., The Coastal District," by W. HOWCHIN, F.G.S.

ANNUAL MEETING, OCTOBER 4, 1904.

J. C. VERCO, M.D., F.R.C.S. (President), in the chair.

The Annual Report and Balance-sheet were adopted

ELECTION OF OFFICERS.—J. C. Verco, M.D., F.R.C.S., as President; Professor E. H. Rennie, D.Sc., F.C.S., and Rev

Thomas Blackburn, B.A., as Vice-Presidents; Walter Rutt, C.E., as Hon. Treasurer.

ELECTION OF MEMBERS OF COUNCIL.—Samuel Dixon and W. H. Selway.

EXHIBITS.—A. H. C. ZIETZ, F.L.S., a large, sound-producing, ground spider, from the Malay Peninsula, and copper ores from Paull's Creek Copper Mine, South Australia. E. ASHBY, bird skins from Woodford, Queensland, *Malurus lamberti* and *M. melanocephalus*, and, for purposes of comparison, *M. assimilis*, from Ardrossan; *Eopsaltria magnirostris*, *Platycercus pallidiceps*, and *Hypotnœdia Philipinensis*. W. H. SELWAY, a piece of shale with dendritic markings. H. BASEDOW, "ironstone biscuits." The exhibitor stated that during a sojourn at Cape Jervis concretions were found on the surface of the glacial deposits occurring in that neighbourhood. Their shape and external characteristics are similar to the limestone "biscuits" of the "biscuit flats": but in this case the composition is hydrated oxide of iron. It was suggested that they might be true pseudomorphs of ironstone after limestone. No examples were, however, found showing an intermediate stage of pseudomorphism, so that, if they be true pseudomorphs, the molecular replacement has been effected in so perfect a manner that the specimens, with the exception of their superior hardness, might easily be mistaken for the darker-coloured varieties of the "limestone biscuits." Mr. HOWCHIN stated that discoid and nodular concretions of limonite were commonly found in the upper part of the glacial beds of this age, and, as the physical conditions under which they occurred at Cape Jervis were not the same as those of the "biscuit flats," he would be inclined to regard them as segregations of ironstone in the clay itself, or at the line of junction between the clay and overlying sand rock, as was the case at Queenstown, Kangaroo Island. The specimens exhibited showed sand grains cemented by the hydrated oxide of iron, which seemed to support this view.

PAPERS.—"Description of New Species of Tertiary Corals," by JOHN DENNANT, F.G.S. "Further Notes on the Australian Coleoptera, with Descriptions of New Genera and Species," by Rev. THOMAS BLACKBURN, B.A. "Petrographical Examination of Some South Australian Quartzites, Sandstones, and Related Rocks," by W. G. WOOLNOUGH, D.Sc., F.G.S. "Note on Tertiary Exposures in the Happy Valley District," by HERBERT BASEDOW. "Geological Report on the Government N.W. Prospecting Expedition to Central Australia, 1903" (Tate Memorial Medal Prize Essay), by HERBERT BASEDOW. "New Australian Lepidoptera, with Synonymic and Other Notes," by A. JEFFERIS TURNER, M.D., F.E.S.

ANNUAL REPORT, 1903-4.

The Council has pleasure in reporting that the work of the Society in various departments of original research has been fully maintained during the past year. Among the principal papers received during the year now closing may be mentioned:—"On the Australian Coleoptera," by Rev. Thomas Blackburn, B.A., No. xxxiv. "Australian Curculionidæ," Part ii., by A. M. Lea. "Recent Corals from the South Australian and Victorian Coasts," by John Dennant, F.G.S.; "New Species of Australian Elachistidæ, etc.," by O. B. Lower, F.E.S. (Lond.). In connection with the Government N.W. Expedition to Central Australia, "Anthropological and Geological Observations," by H. Basedow, and "Descriptions of Some New Species of Orthoptera," collected in the same expedition, have been given in a paper by J. G. O. Tepper, F.L.S. "South Australian Decapod Crustaceans," by W. H. Baker; "South Australian Marine Mollusca," by the President (Dr. Verco), and "New Australian Lepidoptera with Synonymic and other Notes," by Dr. A. Jefferis Turner, F.E.S. In connection with the geology of the State, "The Geology of the Mount Lofty Ranges, Part i.," by W. Howchin, F.G.S.; and "Tertiary Exposures in the Happy Valley District," by H. Basedow.

During the year seven members have been elected, and this increase is largely due to the exertions of one of our number (Mr. Ashby), whose example might well be followed by other Fellows and Associates. There are now on the roll 7 corresponding members, 11 honorary members, 62 fellows, and 2 associates.

The Council regrets to have to record the death of John Howard Angas, a member of the Society since 1874.

With the view of rendering the library of the Society more generally available to members and useful to the scientific public, a scheme for transferring it to the Public Library, drawn up by a committee appointed for the purpose, is now under consideration by the Board of Governors.

Owing largely to the amount of valuable matter that has been received during the year, and partly to shrinkage of the annual grant, some little difficulty was at one time anticipated in meeting current expenses, but this has been happily obviated, the Government having placed on the Estimates a special sum which, with the ordinary sources of revenue, will enable the Council to carry on the work of the Society. In

addition to the foregoing means the President (Dr. Verco) has generously undertaken to bear the cost of all plates illustrating papers on the natural history of South Australia in the forthcoming volume.

The Council has the pleasure of reporting that the Malacological, Microscopical, and Field Naturalists' Sections are doing a useful work in their respective departments, the last-named having attained its twenty-first anniversary.

THE TREASURER IN ACCOUNT WITH THE ROYAL SOCIETY OF SOUTH AUSTRALIA (INCORPORATED).

Dr.	£ s. d.	£ s. d.
October 1st, 1903.		
To Balance		65 3 9
" Subscriptions—		
Royal Society (including £8 3s. 6d. special, from President)	69 16 6	
Field Naturalists' Section	15 0 0	
Malacological Section ...	1 13 0	
Microscopical Section ...	7 12 6	
		94 2 0
" Government grant		73 2 6
" Interest		2 7 8
		£234 15 11

Cr.	£ s. d.	£ s. d.
By Transactions—		
Printing	59 0 0	
Illustrating	13 3 6	
Publishing	5 15 8	
		77 19 2
" Grants in aid—		
Field Naturalists' Section	12 0 0	
Malacological Section ...	1 0 0	
Microscopical Section ...	8 0 0	
		21 0 0
" Library—		
Salary of Librarian ...	10 0 0	
Shelving and Sundries ...	6 16 0	
		16 16 0
" Incorporation and New Rules		0 19 0
" Wages—Caretaker		3 0 0
" Printing, Postage, Stationery, etc.		8 12 7
" Advertising		6 12 8
" Exchange on Cheques ...		0 2 0
" Balance in Savings Bank on October 1, 1904		99 14 6
		£234 15 11

WALTER RUTT, Treasurer.

Adelaide, 1st October, 1904.

Audited and found correct,

DAVID FLEMING, J. S. LLOYD, F.I.A.S.A., } Auditors.

DONATIONS TO THE LIBRARY

For Year 1903-4.

TRANSACTIONS, JOURNALS, AND REPORTS.

Presented by the respective Editors, Societies, and Governments.

Austria and Germany.

Berlin—Königl. Preuss Meteor. Instits.—Ver-offentlichungen der Ergebnisse, 1898 Heft. 3; Beobachtungen, 1899-1900. Abhandlungen Band 2, Nos. 3-4. Königl. Preuss Akademie der Wissenschaften Sitzungsberichte, 1903, Nos. 41-53; 1904, Nos. 1-18, 25-40.

——— Gesellschaft für Erdkunde, Zeitschrift, 1903, No. 6.

——— Deutsches Meteorologisches Jahrbuch, 1902, Heft. 2; 1903, Heft. 1.

——— Berliner Gesellschaft für Anthrop., Ethnol., und Urgeschichte, Zeitschrift für Ethnol, 1903, Heft. 2, 3.

Göttingen—Königl. Gesellschaft der Wissenschaften zu Geschäftliche Mittheilungen, 1904, Heft. 1.

———— Math. phys. Klasse, 1903, Heft. 1, 2, 5, 6.

Heidelberg—Land und Forstwirtschaft in Deutschostafrika, Berichte, Band II., Heft. 1-3.

Munich—K.B. Akademie der Wissenschaften zu, 1903, Heft. 3, 4, 5.

Nüremburg—Naturhistorischen gesellschaft zu, Abhandlungen Band 15, Heft. 1.

————— Klasse der, 1903, Heft. 3, 5.

Vienna—K.K. Geologischen Reichsanstalt, Venhandlungen der, 1903, Nos. 12-18; 1904, No. 1.

——— K.K. Naturhistorischen Hofmuseums, Annalen, Band 18, No. 1.

Kaiserliche Akad. Wissenschaften in Wien, Anzeiger Math. Naturwissenschaft, 1903, Nos. 1-27. Sitzung. der Mathematisch-natur, 1903, Nos. 18-27; 1904, Nos. 1-9, 14-18.

——— Kaiserlichen Mineralogischen Gesellschaft Heransgegeben, Band 2, Heft. 2.

Würzburg—Physikalisch-Medicinischen Gesellschaft, zu-Sitzungs-Berichte, 1902, Nos. 1-6; 1903, Nos. 1-8.

Australia and New Zealand.

Adelaide—Department of Mines, Short Review of the Mining Operations in South Australia for Six Months ending June 30, 1904.

——— St. John Ambulance Association, Annual Report, 1902.

Brisbane—Department of Agriculture, Botany Bulletin, 1904, No. 16.

——— Department of Mines, Geol. Report, Maps Nos. 184-9.

Melbourne—Royal Society of Victoria, vol. xvi., part 2; Victorian Naturalist, vol. xx., Nos. 8-12, vol. xxi., Nos. 4 and 6; Victorian Yearbook, 1902, three copies.

——— Victorian Geographical Journal, vols. xx. and xxi.

——— Victoria Department of Mines, Nos. 9, 11, 12, and 13.

——— Victoria Department of Agriculture, vol. ii., parts 5, 6, 8, and 9, 12-18.

——— Australasian Institute of Mining Engineers, vol. ix., part 2.

Geelong—Geelong Naturalist, second series, vol. i., No. 1.

Perth—Geological Survey of Western Australia, Bulletin No. 8-10, and Maps.

——— Department of Mines, Report, 1902.

——— W.A. Natural History Society, Journal No. 1.

——— Department of Agriculture, Journal, September.

Sydney—Forest Flora of New South Wales, vol. ii., parts 6-11.

——— Australian Museum, Records, vol. iv., No. 8; vol. v., Nos. 3-4; Australian Birds, part 4.; Memoirs, vol. iv., parts 6-8.

——— Department of Public Instruction, New South Wales, Meteor. Obs., 1900.

——— Department of Mines, New South Wales, Annual Report, 1903.

——— Department of Mines and Agriculture, Geological Survey, Memoirs Palæontology, No. 11 and Plates; Agricultural Gazette, vol. xiv., part 12; vol. xv., parts 1, 2, 4, 6, 8, 10.

——— Linnæan Society of New South Wales, Proceedings, vol. xxviii., part 2, 3, Nos. 110-111; vol. xxviii., part 4, No. 112; vol. xxix., parts 1 and 2, Nos. 113-114; Abstract of Proceedings, July 29, 1903; March 30, 1904; April 27, 1904; June 29, July 27, 1904.

Wellington—New Zealand Institute, Trans. and Proc., vol xxxvi.

Hobart—Australasian Association for the Advancement of Science, 1902.

Launceston—Department of Mines, Tasmania, Geological Department, September 30, 1903; December 31, 1903.

BELGIUM.

Brussels—Musée Royale d'histoire Naturelle de Belgique, Extrait des Memoires, tome 1, 1903.

——— Société Royale de Botanique de Belgique, Bulletin, tome 40.

——— Jardin Botanique de l'état a Bruxelles, vol. i., fasc. 4.

CANADA.

Halifax—Nova Scotian Institute of Science, Transactions and Proceedings.

Ottawa—Geological Survey Catalogue of Canadian Birds, part 2.

Montreal—Canadian Record of Science, vol. ix., part 2.

ENGLAND, IRELAND, AND SCOTLAND.

London—Royal Society of London, Sleeping Sickness Commission, Reports Nos. 2-4. Proceedings, vol lxxii., Nos. 481, 483, and 484-487; vol. lxxiii., Nos. 488-9, 492, 496.

——— Chemical Society, Journal, vol. lxxxiii.-iv, November, December, and vol. lxxxiii., Supplement and four parts, 1 and 2; vol. lxxxv.-vi., January, February, March, April, May, July, August.

——— Chemical Society, Proceedings, vol. xix., Nos. 270, 271, 274; vol. xx., Nos. 275-279, 282.

——— Entomological Society of London, Transactions, 1903.

——— Royal Microscopical Society, 1903, part 6, 1904, parts 1 to 4.

——— Anglo-Russian, 1904, March, vols. vii.-ix.

——— Linnæan Society of London, List of Members, etc., 1903-4; Proceedings, October, 1903.

Cambridge—University Library, Report of Lib. Synd., 1903.

——— Cambridge Phil. Soc., Proceedings, vol. xii., parts 4-6.

Manchester—Field Naturalists' and Archæologists' Society Report and Proceedings, 1903.

———— Manchester Lit. and Phil. Soc., Memoirs and Proceedings, vol. xlviii., parts 1 and 3.

———— Manchester Geological Society, Transactions, vol. xxviii., parts 8, 9, 10, and 12.

Leeds—Journal of Conchology, vol. xi., parts 1, 2, 3.

Liverpool—Biological Society, Proceedings and Transactions, vol. xvii.

Belfast—Natural History and Philosophical Society, Report and Proceedings, 1902-3.

Dublin—Royal Dublin Society, Economic Proceedings, vol. i., part 4; Scientific Proceedings, vol. x., part 1; Scientific Transactions, vol. lxxx., parts 2-5.

——— Royal Irish Academy, Proceedings, vol. xxiv., section A, parts 3 and 4, and sections B and C.

France.

Caen—Société Linéene de Normandie, Bulletin, Series 5 and 6.

Paris—Société Entomologique de France, Bulletin, 1903, Nos. 15-21; 1904, Nos. 1, 2, 5, 6, and 9-12.

——— Feuille des Jeunes Naturalistes, Nos. 397-404, and 407.

Rennes—Université de Rennes, Travaux Sc. del, tome 3, fasc. 1, 2.

Nantes—Société des Sciences Naturelles de l'Ouest de la France, Bulletin de la, 2e sér, tome 3, 1er 2e tri.

Italy.

Florence—Società Entomologica Italiana, Bulletino, 35 tri, 1-4.

Milan—Società Italiana de Scienze, Naturali e del Museo Cevico di Storia Naturalo in Milano, vol. xlii., fasc. 3, fogli. 6, fasc. 4o. fogli. 7¼; vol. xliii., fasc. 1/6 and fasc. 2 fo. 6¼.

Pisa—Società Toscana di Scienze Naturali, Atti della Processi Verbali, vol. xiii., 5; vol. xiv., 1, 2.

India.

Calcutta—Indian Museum, Annual Report, 1902-3.

——— Board of Scientific Advice, Annual Report, 1902-3.

Japan.

Kyóto—Imperial University Calendar, 1903-4.

Tokyo—Seismological Society, Earthquake Inves. Com. Pubs. No. 16.

——— Imperial University of Tokyo, Journal, vol. xvii., art. 12; vol. xviii., art. 4-7; vol. xix., art. 2, 8, 10, 11-20.

——— Asiatic Society, vol. xxxi.

Mexico.

Mexico—Instituto Geologico de México-Parergones, to. 1, num. 1 and 2.

Norway and Sweden.

Stockholm—Geologiska Föreningens Förhandlingar Tingotredje, Bandet, 1903, 25.

——— Entomologiske Tidskrift, arg. 24, heft. 1-4.

——— Kongelige Norske Videnskabers Selskabs Skrifter, 1902.

——— Kongel, Vitterhets Historie och Antiquitets Manadsblad Akademiens, 1898-9, 1901-2.

Bergens—Bergens Museum, Aarsberetning, 1902, Aarbog, 1902, 1903, hefte 2, 3.

Russia.

St. Petersburg—Société Imperiale Mineralogique Verhandlungen, band. 41.

———— Comité Géologique, Bulletins, 1902, vol. xxi., Nos. 5-10; Memoirs, vol. xvi., No. 2, vol. xvii., No. 3; vol. xx., No. 1.

Moscow—Société Impériale des Naturalistes de Moscou, Bulletin, 1903, 2 and 3.

Switzerland.

Geneva—Société de Physique et de Histoire Naturelle Compte rendu des Seances, 1903, 20.

Zurich—Naturforschenden Gesellschaft in Zurich Vierteljahrschaft, June, 1901; March, July, 1902; 1902, heft. 3, 4.

Lausanne—Société Vaudoise des Sciences Naturelles Bulletin, vol. xl., 149.

Sandwich Islands.

Honolulu—Fauna Hawaiiensis, vol. i., part 4; vol. iii., part 4.

——— The Bernice Pauahi Bishop Museum, Occasional Papers, vol. ii., Nos. 1 and 2.

South and Central America.

Bueños Ayres—Academia Nacional de Ciencias en Cordoba, Boletin, tomo xvii., entrega 3a.

Peru—Cuerpo de Ingenieros de Minas del Peru, Boletin, Nos. 3, 6, 7, 9.

Monte Video—Museo Nacional Anales, tomo v., entrega 1-160; ser. 2, entrega 1.

South Africa.

Cape Town—South African Museum, Annals, vol. iii., part 4, 5; vol. iv., parts 1-5.

———— South African Association for the Advancement of Science, Report, 1903.

———— Albany Museum, Records, vol. i., part 2.

United States of America.

Boston—American Academy of Arts and Sciences, vol. xxxviii., No. 36; vol. xxxix., Nos. 1-4, 22-23.

Chicago—Field Columbian Museum, Zoological Series, vol. iii., Nos. 10, 11.

——— Field Columbian Museum, Geological Series, vol. ii., No. 1.

Champaign—Illinois State Laboratory of Natural History Bulletin, vol. vi., art. 2.

Cambridge—Museum of Comparative Zoology, Bulletins, vol. xl., No. 7; vol. xliii., Nos. 1, 2, 3; vol. xxxix., No. 9; vol. xli., No. 2; vol. xlv., Nos. 1, 2; vol. xlvi., No. 1.

——— Museum of Comparative Zoology, Harvard College, Bulletin, Geol. Series, vol. vi., part 5.

New York—Public Library, Bulletin, vol. vii., Nos. 10-12; vol. viii., Nos. 1, 2, 3, 4, 6, 8.

——— American Museum Journal, vol. iv., No. 3, and Supplement.

Oberlin—Wilson Bulletin, O.S., 15; Nos. 43, 45, 46.

Philadelphia—American Philosophical Society, Proceedings, vol. xlii., 1903.

Washington—United States Geological Survey, Department of the Interior, Water Supply and Irrigation Papers, Nos. 65-79.

——— Department of Agriculture Yearbook, 1903.

——— Washington Academy of Sciences, Proceedings, No. 5, pp. 231-429.

——— Smithsonian Institution, Proceedings of the United States Natural History Museum, vol. 26.

LIST OF FELLOWS, MEMBERS,

ETC.,

OCTOBER, 1904.

Those marked (L) are Life Fellows. Those marked with an asterisk have contributed papers published in the Society's Transactions.

Any change in the address should be notified to the Secretary.

Date of Election.

Honorary Fellows.

1893. *Cossman, M., Rue de Maubeuge,, 95, Paris.
1897. *David, T. W. Edgeworth, B.A., F.R.S., F.G.S., Prof. Geol., Sydney University.
1888. *Dennant, John, F.G.S., F.C.S., Inspector of Schools, Camberwell, Victoria.
1876. Ellery, R. L. J., F.R.S., F.R.A.S., Gov. Astron., the Observatory, Melbourne, Victoria.
1890. *Etheridge, Robert, Director of the Australian Museum of New South Wales, Sydney.
1893. Gregorio, Marquis de, Palermo, Sicily.
1855. Hull, H. M., Hobart, Tasmania.
1892. *Maiden, J. H., F.L.S., F.C.S., Director Botanic Gardens, Sydney, New South Wales.
1898. *Meyrick, E. T., B.A., Elmswood, Marlborough, Wilts, England.
1876. Russell, H. C., B.A., F.R.S., F.R.A.S., Gov. Astron., Sydney, New South Wales
1894. *Wilson, J. T., M.D., Prof. of Anatomy, Sydney University.

Corresponding Members.

1881. Bailey, F. M., F.L.S., Colonial Botanist, Brisbane, Queensland.
1881. *Cloud, T. C., F.C.S., Manager Wallaroo Smelting Works, S.A.
1880. *Foelsche, Paul, Inspector of Police, Palmerston, N.T.
1893. *McKillop, Rev. David, Daly River Mission, N.T.
1886. Nicolay, Rev. C. G., Fremantle, W.A.
1883. *Stirling, James, Gov. Geologist, Victoria.
1893. Stretton, W. G., Palmerston, N.T.

Fellows.

1895. *Ashby, Edwin, Royal Exchange, Adelaide.
1902. *Baker, W. H., Glen Osmond road, Parkside.
1887. *Blackburn, Rev. Thomas, B.A., Woodville.
1886. *Bragg, W. H., M.A., Prof. of Mathematics, University of Adelaide, S.A.
1883. *Brown, H. Y. L., F.G.S., Gov. Geologist, Adelaide, S.A.
1882. Browne, L. G., Davenport Chambers, Currie street, Adelaide, S.A.

1893. Brummitt, Robert, M.R.C.S., Gilberton.
1901. *Basedow, Herbert, Kent Town.
1899. Browne, T. L., Marlborough Chambers, Adelaide, S.A.
1879. *Cleland, W. L., M.B., Ch.M., J.P., Colonial Surgeon, Resident Medical Officer Parkside Lunatic Asylum, Lecturer in Materia Medica, University of Adelaide.
1895. Cleland, John B., M.D., Ch.B., London, England.
1876. (l) Cooke, Ebenezer, Commissioner of Audit, Adelaide.
1904. Christie, William, Adelaide.
1887. *Dixon, Samuel, Bath street, New Glenelg.
1902. Edquist, A. G., Hindmarsh.
1886. Fleming, David, 24, Buxton street, North Adelaide.
1880. *Goyder, George, A.M., F.C.S., Analyst and Assayer, Adelaide.
1896. Greenway, Thos. J., Chillagoe, Queensland.
1904. Gordon, David, Gawler place, Adelaide.
1904. Griffith, H., Hurtle square, Adelaide
1904. Gartrell, Jas., Burnside.
1896. Hawker, E. W., F.C.S., Adelaide.
1899. *Higgin, A. J., Assistant Lecturer on Chemistry, University of Adelaide.
1891. *Holtze, Maurice, F.L.S. Director Botanic Gardens, Adelaide.
1883. *Howchin, Walter, F.G.S., Lecturer on Geology and Palæontology in the University, Adelaide.
1902. Iliffe, Jas. Drinkwater, B.Sc., Prince Alfred College, Kent Town.
1893. James, Thomas, M.R.C.S., Moonta, South Australia.
1900. *Johncock, Chas. F., Morphett Vale.
1902. Jeffreys, Geo., School of Mines, Adelaide.
1898. *Koch, Max, Port Pirie.
1899. Kleeman, Richard, University, Adelaide.
1884. Lendon, A. A., M.D. (Lond.), M.R.C.S., Lecturer on Forensic Medicine and on Chemical Medicine, University, and Hon. Physician, Children's Hospital, North terrace, Adelaide.
1856. *Lloyd, J. S., Alma Chambers, Adelaide.
1897. *Lea, A. M., Gov. Entomologist, Hobart, Tasmania.
1888. *Lower, Oswald B., Broken Hill, New South Wales.
1874. Mayo, Geo. G., C.E., Tatham street, Adelaide.
1897. *Morgan, A. M., M.B., Ch.B., Angas street, Adelaide.
1884. Munton, H. S., North terrace, Adelaide.
1859. (l) Murray, David. Adelaide.
1883. Phillipps, W. H., Adelaide.
1886. Poole, W. B., Savings Bank, Adelaide.
1885. *Rennie, Edward H., M.A., D Sc. (Lond.), F.C.S., Professor of Chemistry, University of Adelaide.
1869. *Rutt, Walter, Chief Assistant Engineer, Adelaide.
1904. Reissmann, Charles, M.A., M.D. (Cantab.), B.Sc. (Lond.), etc., College Town, Adelaide.
1891. Selway, W. H., Treasury, Adelaide.
1893. Simson, Augustus, Launceston, Tasmania.
1857. *Smeaton, Thomas D., Blakiston, S.A.
1900. Smeaton, Stirling, B.A., C.E., Engineer-in-Chief's Office, Adelaide.
1871. Smith, Robert Barr, Adelaide.
1881. *Stirling, Edward C., C.M.G., M.A., M.D., F.R.S., F.R.C.S., Professor of Physiology, University of Adelaide, Director of S.A. Museum.

1886. *TEPPER, J. G. O., F.L.S., Entomologist, S.A. Museum.
1897. *TORR, W. G., LL.D., M.A., B.C.L., Brighton.
1894. *TURNER, A. JEFFERIS, M.D., Brisbane, Queensland.
1904. TAYLOR, WILLIAM, St. Andrews, North Adelaide.
1889. VARDON, Hon. JOSEPH, M.L.C., J.P., Commissioner of Public Works.
1878. *VERCO, JOSEPH C., M.D., F.R.C.S., Lecturer on the Principles and Practice of Medicine and Therapeutics, University of Adelaide.
1902. VANDENBERGH, W. J., Barrister and Solicitor, J.P., Pirie street, Adelaide.
1883. WAINWRIGHT, E. H., B.Sc. (Lond.), St. Peter's College, Hackney, Adelaide.
1878. WARE, W. L., J.P., Adelaide.
1859. WAY, Right Hon. Sir SAMUEL JAMES, Bart., D.C.L., Chief Justice and Lieutenant-Governor of South Australia, Adelaide.
1902. *WOOLNOUGH, WALTER GEORGE, D.Sc., F.G.S., Lecturer on Mineralogy and Petrology, University of Adelaide.
1904. WHITBREAD, HOWARD, Currie street, Adelaide.
1886. ZIETZ, A. H. C., F.L.S., C.M.Z.S., Assistant Director, South Australian Museum, Adelaide.

ASSOCIATES.

1901. COLLISON, EDITH, B.Sc., Medindie.
1904. ROBINSON, Mrs. H. R., "Las Conchas," Largs Bay, South Australia.

APPENDICES.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia.

TWENTY-FIRST ANNUAL REPORT OF THE COMMITTEE.

For the Year Ending September 30, 1904.

Before dealing with the salient features of the work of the past year it is fitting to call attention to the fact that this is the Committee's twenty-first report, and that the Section, therefore, after allowing for the alteration in the month in which the annual meeting was originally held, viz., from October to September, has practically attained its majority. The celebration of this event will take the form of a conversazione, to be held next month, when it is intended to review the history of the Section. Any detailed allusion to this event will, therefore, not appear until the report for the forthcoming year is presented in due course.

Evening Meetings.

During the year eight evening meetings have been held, at which the following papers have been presented:—

October 20, 1903—"Plants and Their Enemies," S. Smeaton, B.A.

November 17, 1903—"Insect Life," H. H. D. Griffith.

April 19, 1904—Boys' Field Club Easter Encampment, Murray Bridge, W. G. Woolnough, D.Sc., and S. Smeaton, B.A.

May 17, 1904—"Natural History Notes from the South-East," J. Aitken.

May 17, 1904—"Notes of a Trip over the Great Dividing Range, Victoria," W. H. Selway.

June 21, 1904—"Notes of a Visit to the Eastern States," Mrs. J. F. Mellor.

July 19, 1904—"Some Glimpses of the Plan of Nature," Dr. J. W. Henderson.

August 16, 1904—"Difference in Size and Plumage of Birds in North and South Parts of Australia," A. H. Zietz, F.L.S.

August 16, 1904—"Notes on the Adaptation of Foliage to its Environment," S. Smeaton, B.A.

September 20, 1904—Annual Meeting, Chairman's Address, "Animal Instinct or Reason," E. H. Lock, F.R.H.S.

It will be seen from this list that there has been considerable diversity in the subjects brought before the members. Two of the papers dealt with the natural history features of the eastern States. While botany has, perhaps, been the most favoured subject, entomology and ornithology are also represented. The last-named department has not received much attention since the establishment of the Ornithological Association here, but the hope may be expressed that while to that body may fitly be left the work of the specialist in that subject, the bird-loving members of our Section will occasionally give us in a more general way the benefit of their observations in that interesting realm of natural history. We have gone outside the ranks of our own members for only one paper during the year, that by Dr. J. W. Henderson, most of whose thoughtful and stimulating address on "Some Glimpses of the Plan of Nature" was printed in the columns of the daily press.

The exhibits have proved an interesting feature of the evening meetings, and during the year minerals, plants, insects, birds, and many other specimens have been shown. Amongst the exhibits were the lichen *Sticta stipitata*, from Pewsey Vale, the largest lichen in South Australia, and probably not previously recorded for this State; the fruit of *Marsdenia Leichardtiana*, from Central Australia; the orchid *Microtis atrata*, from Square Waterhole; a trapdoor spider's nest, from Western Australia, remarkable for having a window in the centre of the door; opals, from White Cliffs; brown coal, from Lake Phillipson bore; the flower of the plant *Choretrum glomeratum*, from Victor Harbour district; an aboriginal axe-head made of diorite; the fruit of the camphor tree; and ground-bees' cocoons, made of segments of green leaves—an occurrence seemingly not previously noted.

Excursions.

The following is a list of the twelve excursions held during the year:—

October 3, 1903—Happy Valley (via Tapley's Hill, returning via Coromandel Valley).

October 17, 1903—Grenville Glen, near Crafers.

November 7-9, 1903 (three days)—Maclaren Vale, Square Waterhole, Clarendon, etc.
December 12, 1903—National Park.
January 23, 1904—Dredging, Port River.
April 23, 1904—"Las Conchas," Largs Bay, Mrs. H. R. Robertson's collection of shells.
May 21, 1904—Stonyfell.
June 18, 1904—Blackwood.
July 16, 1904—Black Hill.
August 20, 1904—Brownhill Creek (northern branch).
September 1, 1904 (whole day)—Mount George, near Bridgewater.
September 17, 1904—Anstey's Hill, to Teatree Gully.

Of these excursions ten have been half-day outings, one a whole-day, and one a three-days' trip. The three days' excursion (November, 1903) was taken south from Adelaide, Maclaren Vale being the headquarters. This afforded an opportunity of visiting the Square Waterhole district, one of our best localities for native flowers. There we collected many plants not to be found nearer the city. Through the kindness of local friends this lengthy excursion was rendered particularly pleasurable in a social sense, while the route traversed embraced some of our finest hills scenery.

The whole-day trip to Mount George, on September 1, was a pleasant outing, but not very successful botanically, perhaps being too early in the season. This place had not been visited by the Section since January, 1884. It is somewhat difficult at this stage of the Section's existence to find suitable new localities for Saturday afternoon excursions, but during the year two fresh places have been visited, viz., Grenville Glen, near Crafers (when the party were the guests of Mr. and Mrs. G. J. Ireland), and Brownhill Creek (northern branch). By way of experiment the hills at Blackwood were visited earlier (June 18) than hitherto, and this district again gave evidence of its wealth of native flora, especially in orchids. In further proof of this may be mentioned the fact that at an excursion of the Boys' Field Club to this locality later in the season (September 10) no fewer than twenty species of orchids were collected. At Happy Valley, on October 3, 1903, ten species of orchids were gathered.

As a change from botanical investigations, one dredging trip has been held, and, through the kindness of Mrs. H. R. Robertson, an excursion to see her fine conchological collection at "Las Conchas," Largs Bay," was arranged. Further variety was added by a visit to the Olive Company's plantations at Stonyfell, and the Stonyfell Wine Company's cellars, when the processes of oil and wine manufacture were

explained to the members through the courtesy of the officers of these Companies.

The 1903 season's excursions were terminated by a picnic to National Park on December 12. The Section takes a peculiar interest in this Park, owing to the labours of some of its members in getting it vested in trustees as the people's heritage, and would like to see more done in the direction of protecting its native flora, as well as establishing our native fauna among its picturesque hills and dales.

The average attendance at the evening meetings has been greater than for several years past, while the excursions have also maintained their popularity.

A separate report from the Native Fauna and Flora Protection Committee is presented herewith, and contains, *inter alia*, references to the protection oi birds in the Northern Territory, the omission of pelicans from the Fisheries Bill, and the suggested establishment of our native mammals in the National Park.

Resignation of Chairman, etc.

In April, 1904, owing to his departure for Europe, we lost the services of our Chairman for the current year (Dr. E. Angas Johnson), the balance of whose term of office has been filled by Mr. E. H. Lock. Dr. Johnson has been elected a Corresponding Member. We also regretted to receive the resignation of Mrs. S. L. Schourup, who was connected with the Section for many years, was most regular in her attendance, and also occupied a position on the Committee for some years prior to and until her retirement.

The Committee in November, 1903, purchased a dredge in place of the one lost in the Port River, and it has already been used with satisfactory results on our sea trips.

Financial.

The receipts from subscriptions have been £15, which, as usual, is paid to the Royal Society, and the expenditure £13 2s. 6d., so that we have again been self-supporting, not taking into consideration the Government subsidy which the parent Society gets on our subscriptions.

Membership.

Fresh names continue to be added to our roll, mostly those of ladies. The additions have been nine, and the withdrawals seven, leaving the membership now seventy-six.

E. H. Lock, Acting Chairman.
W. H. Selway, Hon. Secretary.

Adelaide, September 19, 1904.

SIXTEENTH ANNUAL REPORT OF THE NATIVE FAUNA AND FLORA PROTECTION COMMITTEE OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

The last report of your Committee referred to the proposed steps to be taken for obtaining some much-desired alteration in the Birds' Protection Act, a Bill for the amendment of which had been introduced by Mr. Herbert, M.P. That gentleman, however, was afraid that the Committee's amendments might interfere with the passing of his Bill, which was intended to apply chiefly to the Northern Territory, and it was decided to await a more favourable opportunity for action in the matter. The Bill was assented to on October 30, 1903, and gave power to alter by proclamation the close season for birds in the whole, or in any portion of the State; provided for the licensing of bird catchers in the Northern Territory; and made illegal the use of guns of a larger bore than No. 8 or of a greater weight than 15 ℔. Up to the present time no proclamation has been made, but the necessary action for bringing the Act into operation will shortly be taken by the Government.

During the last session of Parliament a Bill for the better protection of fisheries was brought in, which provided, among other things, for the payment of capitation fees for the destruction of pelicans, cormorants, and turtles. Some members of the Committee strongly urged upon the gentleman under whose direction the Bill had been drawn the desirability of omitting the pelicans from the ban thus placed upon them, pointing out that their numbers had already been enormously reduced without any apparent benefit, and protesting against any attempt to exterminate these magnificent birds. The Bill was not passed last session, but has again been introduced, and your Committee are pleased to learn that, in deference to their representations and to those of a well-known Victorian ornithologist, who was consulted, the pelicans are not mentioned in the new Bill.

The Hon. Mr. Pascoe last week introduced a Bill for amending the Game Act, the object of which—to provide a close season for opossums—is much to be commended.

The Committee regret that so far the Commissioners of the National Park have not been able to carry out one of the chief objects the Committee had in view when they obtained the grant of the Park, namely, the establishment of a breeding-ground for some of our native mammals. They sincerely hope the Commissioners will take this important matter into their immediate consideration, and that a sufficiently large area of the land may be securely enclosed for the purpose.

SAML. DIXON, Chairman.
M. SYMONDS CLARK, Hon. Secretary.

Adelaide, September 19, 1904.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

RECEIPTS AND PAYMENTS FOR THE YEAR 1903-4.

Dr. Receipts.	£	s.	d.
To Balance brought forward	4	5	5
" Subscriptions	15	0	0
" Grant from Royal Society	12	0	0
	£31	5	5

Payments. Cr.	£	s.	d.	£	s.	d.
By Postages and Sundries	4	12	6			
" Printing	5	1	6			
" Dredge	1	5	0			
" Advertising	1	3	6			
" Attendance	1	0	0			
				13	2	6
" Subscriptions, as per contra, handed over to Royal Society				15	0	0
" Balance in hand				3	2	11
				£31	5	5

Audited and found correct.

J. S. LLOYD, } Auditors.
WALTER D. REED, }

Adelaide, September 19, 1904.

W. H. SELWAY, Hon. Secretary and Treasurer.

MALACOLOGICAL SECTION.

ANNUAL REPORT FOR 1903-4.

The Section begs to report that nine meetings have been held during the year, and steady progress has been made in the revision of the census of South Australian mollusca. The list of lamellibranchiata was completed at the beginning of the financial year, and, omitting the polyplacophera, the Section continued to follow the order of classification as given by Zittel. The scaphopoda were dealt with, and of the gastropoda the following families: patellidæ, haliotidæ, pleurotomariidæ, fissurellidæ stomatellidæ, turbinidæ, phasianellidæ, delphinulidæ, and part of the trochidæ.

Jos. C. Verco, Chairman.

Robt. J. M. Clucas, Hon. Secretary.

October 3, 1904.

MALACOLOGICAL SECTION OF THE ROYAL SOCIETY.

Statement of Accounts.

Receipts.

	£	s.	d.
In hand from 1902-03	0	13	0
To Subscriptions	1	17	6
	£2	10	6

Expenditure.

	£	s.	d.
By Postages	0	6	9
" Paid over to Treasurer of the Royal Society	1	17	6
" Balance in hand	0	6	3
	£2	10	6

MICROSCOPICAL SECTION.

ANNUAL REPORT FOR 1903-4.

This Section was re-established on September 17, 1903, and the following officers elected:—Chairman, D. Fleming; Committee, W. B. Poole, W. Fuller, and D. Gordon; Hon. Secretary, E. J. Bradley, Dover street, Malvern. At the evening meetings the following papers were read:—"The Life History of the Grain Rusts," by W. B. Poole; "Modern Methods Employed in Killing and Preserving Organisms for Microscopical Examination," by W. Fuller; "Life History of Fresh Water Polyzoa," by W. B. Poole; "The Study of Potable Water as Stored in Large Reservoirs," by E. J. Bradley. In addition to the above, an evening was spent in the physiological laboratory of the University, by invitation of Professor Stirling, to see the general microscopic methods used in that department, and another evening was devoted to a photo-micrographic and lantern exhibition, given by W. B. Poole and W. P. Dollman. Five evenings were utilised for microscopical exhibits, and field excursions were made to the following places:—Blackwood, Fulham, Torrens Lake; dredging excursion in Port River, Semaphore Jetty, and a second visit to Blackwood. Members on the roll, 34.

MICROSCOPICAL SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Balance Sheet, Session 1903-4.

Receipts.

	£	s.	d.
Royal Society Grants	8	0	0
Subscriptions	7	12	6
	£15	12	6

Expenditure.

	£	s.	d.
Postage	2	10	4
Advertising and Printing	1	11	0
Stationery	0	3	0
Kerosine and Limelight Lantern	0	9	1
Subscriptions paid to Treasurer of Royal Society	7	12	6
Stamps—Duty on Receipts	0	0	2
Caretakers—Grants to	1	10	0
Balance in hand	1	16	5
	£15	12	6

Edgar J. Bradley, Hon. Secretary.

Audited and found correct.
Theo. Godlee, Auditor.

GENERAL INDEX.

[Generic and specific names printed in italics are described as new.]

Aboriginals, Art of Australian, 38; Flint Quarry, worked by, 302.
Acantholophus convexiusculus, 112.
Acherres *globicollis*, 114.
Adisura marginalis, 213.
Ædriodes *humeralis*, 113.
Æoloscelis *aulacosema*, 172; *euphædra*, 172; *hemicroca*, 173; *petrosarca*, 173.
Alope, 154; A. *australis*, 154
Alpha Rays of Radium, 302.
Amycterus draco, 112.
Angasia, 147; A. *elongata* 147; *kimberi*, 149; *robusta*, 150; *tomentosa*, 152.
Annual Report, 306.
Anthropological Notes, North-west Prospecting Expedition, 12.
Axiorata *glycychroa*, 218.
Baker, W. H., Decapod Crustacea of South Australia, 146.
Balance Sheet, 308.
Balaninus, 132; B. *æqualis*, 133; *delicatulus*, 134; *intricatus*, 133; *submaculatus*, 134.
Balanophyllia *basedowi*, 74; *cauliculata*, 73; *dilatata*, 10; *fossata*, 70; *induta*, 69; *patula*, 71; *torta*, 72; *truncata*, 68.
Basedow, H., Anthropological Notes, 12; Tertiary Deposits of Happy Valley District, 248; "Ironstone Biscuits," 303.
Bathyactis *beaumariensis*, 66· *excelsa*, 67.
Batrachedra *hypoleuca*, 170; *lygropis*, 170; *stenosema*, 170; *zonochra*, 169.
Belus abdominalis, 132; granulatus, 132.
Birthama *dochmographa*, 241; leucosticta, 241; plagioscia, 241.
Blackburn, Rev. T., Further Notes on Australian Coleoptera, 281.
"Boiling Spring," near Mount Hamilton, 301.
Borkhausenia (?) *amphixantha*, 169; *erythrocephala*, 169.
Bragg, Prof. W. H., on the Absorption and Classification of the Alpha Rays of Radium, 298.
Brighton Limestones, 262.
Cadulus acuminatus, 138.
Calicotis *microgalopsis*, 171.
Callipona, 236; *C. metabolis*, 236.
Cancellaria *pergradata*, 142.
Cassidea *sinuosa*, 141.
Ceratotrochus australiensis, 56.
Cherrus cænosus, 93; infaustus, 93; marstersi, 93; plebejus, 93; punctipennis, 93.
Coleoptera, Australian, 281.
Conosmilia *granulata*, 65; *stylifera*, 66.
Corals, New Australian Tertiary, 52; Recent Australian, 1.
Corula *deltosticha*, 215.
Coryphistes *cyanopteroides*, 164; *nigroconspersus*, 166; *serratus*, 165.
Crustacea, New South Australian Decapod, 146.
Cryptophasa *alphitodes*, 244; *themerodes*, 244.
Cryptoscopha, 238; *C. aprepes*, 238.
Curculionidæ, Description of Australian, 77
Cycotida lineata, 132.
Cylicia rubeola, 9
Deilinia *acrocosma*, 236; *catharodes*, 237.
Deltocyathus *fontinalis*, 61; *stellaris*, 60; verconis, 62; *vincentinus*, 6.
Dennant, J., Recent Corals of Australia, 1; New Australian Tertiary Corals, 52.
Dentalium intercalatum, 135.
Discotrochus (?) *pateriformis*, 57.
Donations to the Library, 309.
Doratifera unicolor, 241.
Ectropis *hemiprosopa*, 230.
Elachistidæ, New Species of, 168.
Encryphia, 228: *E. argillina*, 228.
Entometa *plinthopa*, 239; *spodopa*, 239.
Erastria *rhaptina*, 217.
Esmelina flavovittata, 93; *stenocera*, 92.
Essolithna, 94; E. *cordipennis*, 98: *fissiceps*, 96; *kingiæ*, 98; *maculata*, 97; *militaris*, 96; pluviata, 95; rhombus, 95; *terrena*, 97.
Ethemaia *apicalis*, 107; *emarginata*, 108; *funerea*, 109; sellata 110; *vagans*, 109.

Euchloris *argosticta*, 220; *callisticta*, 222; *leucospilota*, 221; *periphracta*, 219; *tanygona*, 220; *thalassica*, 221; vertumnaria, 222.
Euplexia *chloeropis*, 213.
Euthyphasis acuta, 82; *lineata*, 82; *sordidata*, 82.
Eutinophæa *dispar*, 79; *falcata*, 80.
Evadodes *rugiceps*, 79.
Evas *elliptica*, 77; *latipennis*, 78.
Fellows, Members, etc., List of, 315.
Field Naturalists' Section, Annual Report, 318.
Field River, Geology of, 265.
Flabellum *grangense*, 54; *medioplicatum*, 52; *microscriptum*, 53.
Flinders Range, Geology of, 300.
Fraus, 245; F. bilineata, 246; crocea, 246; simulans, 246.
Gastrina *catasticta*, 237.
Geology of the Mount Lofty Ranges, 253.
Granites, Petrological Description of, 181.
Gryllacris *atrofrons*, 167.
Happy Valley, Tertiary Deposits of, 248.
Heliosia *charopa*, 212.
Hepialus cyanochlorus, 247; eximius, 246; mirabilis, 247; ramsayi, 246; scotti, 246; splendens, 246.
Holcotrochus *crenulatus*, 3; scriptus, 3.
Homoetrachelus *hadromerus*, 84.
Homophyllia, 7; H. australis, 8.
Homophylotis, 243; *H. thyridota*, 243.
Homospora, 229; *H. procrita*, 230.
Howchin, W., Geology of the Mount Lofty Ranges, 253; Flinders Ranges, 300; Lake Eyre District, 301.
Hyborrhynchus mastersi, 112.
Hyphæria assimilis, 110.
"Ironstone Biscuits," 303.
Ischyja *porphyrea*, 217.
Laemosaccus, 134.
Lea, Arthur M., Descriptions of Australian Curculionidæ, 77.
Leiopyrga octona, 140.
Lepidoptera, New Australian, 212.
Leptocyathus (?) *convexus*, 59.
Leptops *brachystylus*, 103; *canaliculatus*, 102; echidna, 106; *elegans*, 105; *granulatus*, 99; *horridus*, 104; *maleficus*, 100; *nodicollis*, 100; *setosus*, 101; spinosus, 106; squalidus, 106; tuberculatus, 106.
Library of the Society, Motion relating to, 299.
Lichenaula *callispora*, 245.
Limacodidæ, Tabulation of, 240.
Limnœcia *anisodesma*, 174; *heterozona*, 174; *isodesma*, 174.
Loranthus exocarpi, on Citrus, 299.
Lower, Oswald B., New Species of Australian Elachistidæ, 168.
Lyncestis *macrosticha*, 216.
Malacological Section, Annual Report, 324.
Maleuterpes spinipes, 79.
Mandalotus *amplicollis*, 118; *campylocnemis*, 116; *excavatus*, 119; *pallidus*, 120; *piliventris*, 116; *pinguis*, 120; *pusillus*, 121; *reticulatus*, 121; *scaber*, 117; *subglaber*, 122; *spurcus*, 118; *suturalis*, 119.
Matesia, 87; *M. maculata*, 87.
Medicasta *leptopsoides*, 110.
Megalodes *hedychroa*, 218.
Microscopical Society, Annual Report, 325.
Mollusca, New Australian Marine, 135.
Molochtus tibialis, 113.
Mound Springs, 301.
Mount Hamilton, 301.
Mount Lofty Ranges, Geology of, 253.
Mount Remarkable, Geology of, 300.
Myllocerus *carinatus*, 85; *usitatus*, 86.
Nacella *crebrestriata*, 144.
Natada *monomorpha*, 242.
Native Fauna and Flora Protection Committee, Annual Report, 322.
Nearcha *nephocrossa*, 227; oxyptera, 226; *prosedra*, 226; ursaria, 226.
Nodaria *aneliopsis*, 219.
North-west Prospecting Expedition, Anthropological Notes, 12.
Notonophes, 112.
Oculina *umbellata*, 63.
Ocystola *heliotricha*, 168.
Oditesus *tibialis*, 114.
Olary, Petrographical Descriptions of Granites from, 181.
Onkaparinga River, Geology of, 269.
Ophthalmorychus parallelus, 84; *spongiosus*, 83.
Opsirhina albigutta, 240.
Orsonoba, 233; O. clelia, 234; *leucoprepes*, 235; *luteola*, 234; *zapluta*, 234.
Orthoptera, New Species of, 162.
Parasa brachyopa, 242; loxogramma, 242; *loxoleuca*, 242.
Parasmilia *flindersensis*, 64; *lucens*, 64.
Pelororrhinus *amplipennis*, 124.
Pephricus, 94; P. echimys, 95; nanus, 95.
Periplaneta *basedowi*, 162.
Petrographical Description of Granites from Olary, 181.
Petrographical Notes on South Australian Quartzites, etc., 193.
Phloeopola *sciaspila*, 168.
Phrynixus astutus, 115.
Pielus *aphenges*, 247.
Placotrochus *magnus*, 54.
Platytrochus compressus, 4; hastatus, 4; *maudensis*, 56.
Plesiastræa *proximans*, 9.
Pleurolopha, 233; *P. nebridota*, 233.

Plumelella repens, 299.
Polyphorus mylitta, 302.
Polyphrades *despicatus*, 89; *exoletus*, 89; *extenuatus*, 90; *granulatus*, 91; *setosus*, 90; tumidulus, 92; *vitis*, 88.
Praxis alampeta, 216.
Proceedings, Abstract of, 300.
Procometis *aplegiopa*, 245.
Prometopus inassueta, 215; *nodyna*, 215; *rubispersa*, 214; *xerampelina*, 214.
Propatria, 213.
Prorocrania, 225; *P. argyritis*, 226.
Prosayleus phytolymus, 79.
Proxyrus lecideosus, 86.
Psalidura, 111.
Pseudomantis *pulchellus*, 163.
Pseudoterpna *bryophanes*, 222; *myriosticta*, 223.
Purple Slates, Cambrian, 260.
Quartzites, Petrographical Notes on South Australian, 193.
Radium, Alpha Rays of, 298.
Rhadinosomus lacordairei, 81.
Rhinaria *asberrans*, 129; *bisulcata*, 126; *caudata*, 125; cavirostris, 130; *concavirostris*, 125; *convexirostris*, 129; *favosa*, 127; signifera, 130; *simulans*, 128; stellio, 130; *sulcirostris*, 126; *tragocephala*, 127.
Rhinaria, Tabulation of, 130.
Rhizotrochus *radiatus*, 2.
Scioglyptis *emmelodes*, 232.
Sclerorrhinus acuminatus, 112; adelaidæ, 112; angustus, 112; arenosus, 112; asper, 112; divaricatus, 112; interioris, 112; nodulosus, 112; sordidus, 112; waterhousei, 112.
Selidosema *leucodesma*, 231; *symmorpha*, 231.
Septifer *subfenestratus*, 251.
Stathmopoda *holobapta*, 171; *trichopeda*, 171.
Stenoscaptia *phlogozona*, 212.
Stephopoma nucleogranosum, 143.
Susica alphæa, 243; miltocosma, 243.
Symphyta cyclomela, 240.
Syntomactis *argoscia*, 175; *decalopha*, 175; *gnophodes*, 176; *melamydra*, 177; *perinephes*, 176; *polychroa*, 176.
Systatica, 229; *S. xanthastis*, 229.
Talaurinus camdenensis, 111; excavatus, 111; foveatus, 111; simillimus, 111.
Tapley's Hill, Clay Slates of, 264.
Taxeotis *acrothecta*, 223; *adelpha*, 224; *epigaea*, 225; *orphnina*, 224.
Tepper, J. G. O., New Species of Orthoptera, 162.
Tertiary Deposits of Happy Valley District, 248.
Thosea bombycoides, 242; liosarca, 242.
Timareta figurata, 123.
Titinia brevicollis, 86.
Trachydora *anthrascopa*, 179; *argoneura*, 180; *centromela*, 179; *leucobathra*, 177; *microleuca*, 180; *molybdimera*, 179; *polyzona*, 178; *zophopepla*, 178.
Trematotrochus *verconis*, 5.
Trictena labyrinthica, 247.
Trochocyathus *wilkinsoni*, 58.
Trox, 282; T. alatus, 283; alternans, 283; asperatus, 284; asperrimus, 284; australasiæ, 285; carinatus, 285; castelnaui, 285; dilaticollis, 284; *eyrensis*, 293; mentitor, 295; nodicollis, 284; *perhispidus*, 296; sabulosus, 297; salebrosus, 284; semicostatus, 284; *setosipennis*, 292; squamosus, 285; subcarinatus, 283; tatei, 285, 291; *tasmanicus*, 292; *tricolor*, 295.
Trox, Tabulation of Australian species, 288.
Turner, Dr. A. J., New Australian Lepidoptera, 212.
Verco, Dr. J. C., South Australian Marine Mollusca, 135.
Vercoia, 157; *V. gibbosa*, 158.
Vocabulary of the Karkurrerra Tribe, 47.
Woolnough, W. G., Petrographical Descriptions of Granites from Olary, 181.
Woolnough, W. G., Petrographical Notes on South Australian Quartzites, 193.
Xylorycta *cirrhodes*, 244.
Xynæa *uniformis*, 123.
Zephryne *personata*, 115.
Zeuctophlebia, 227; Z. rufipalpis, 228; *tapinodes*, 228.

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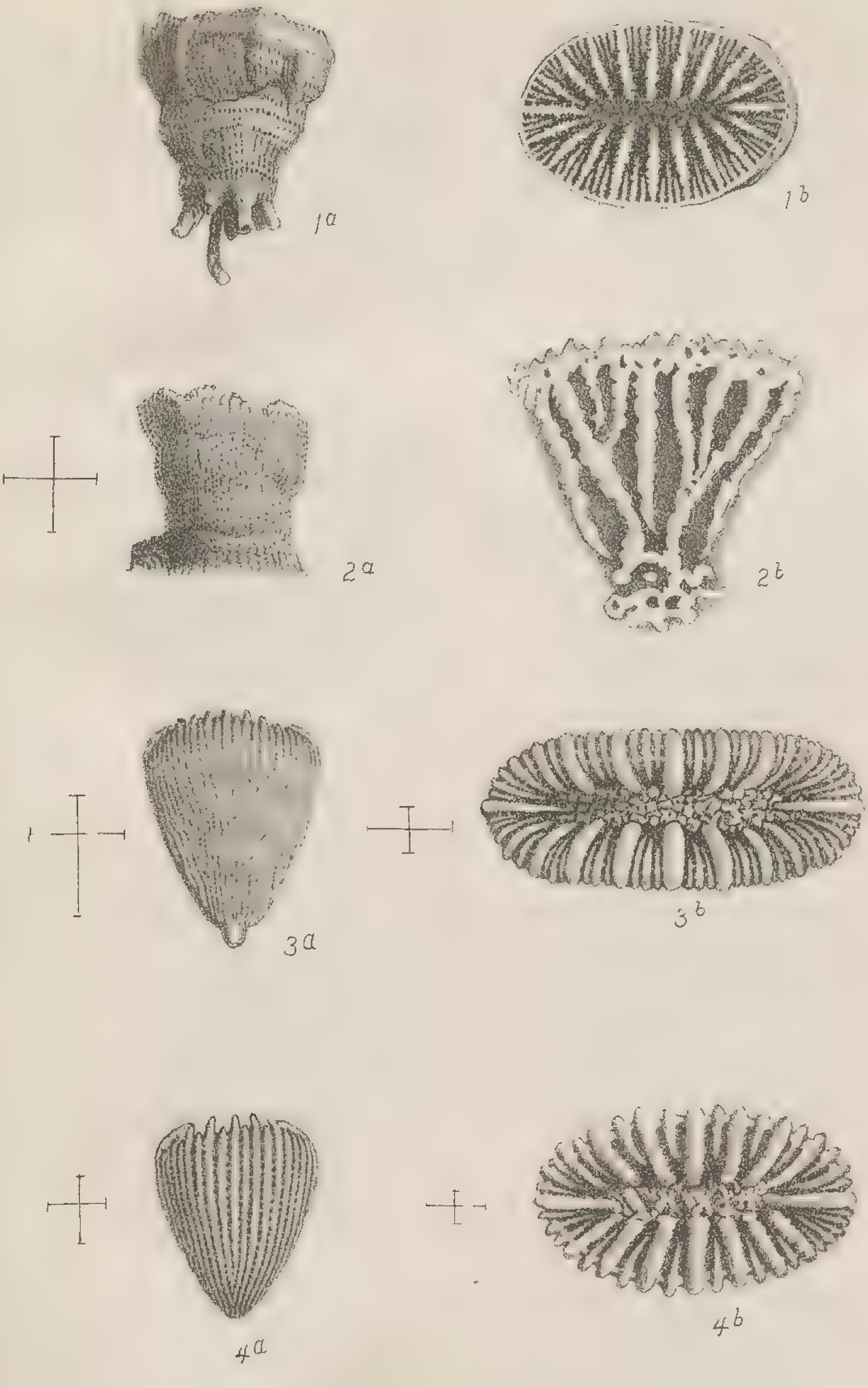

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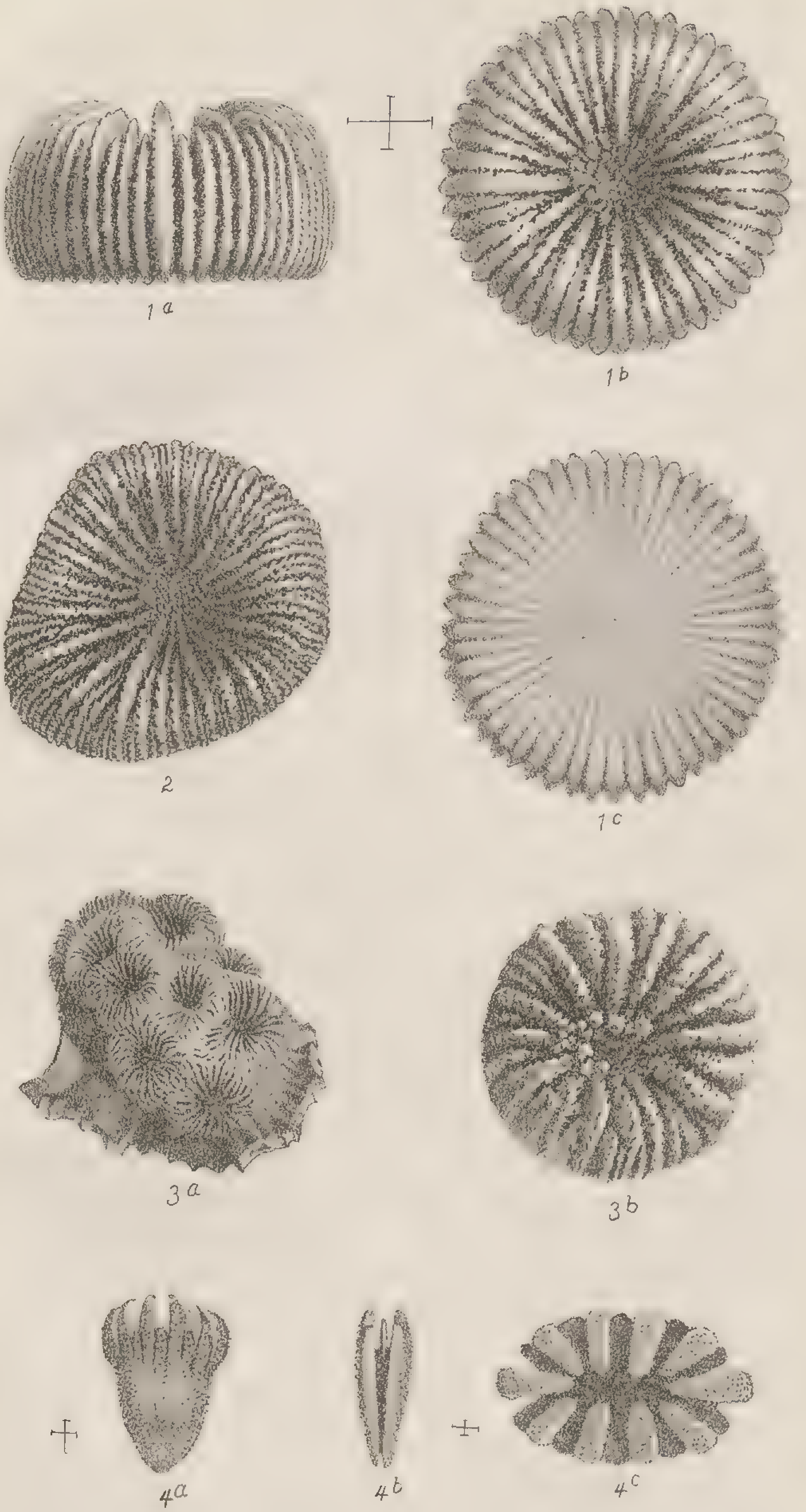

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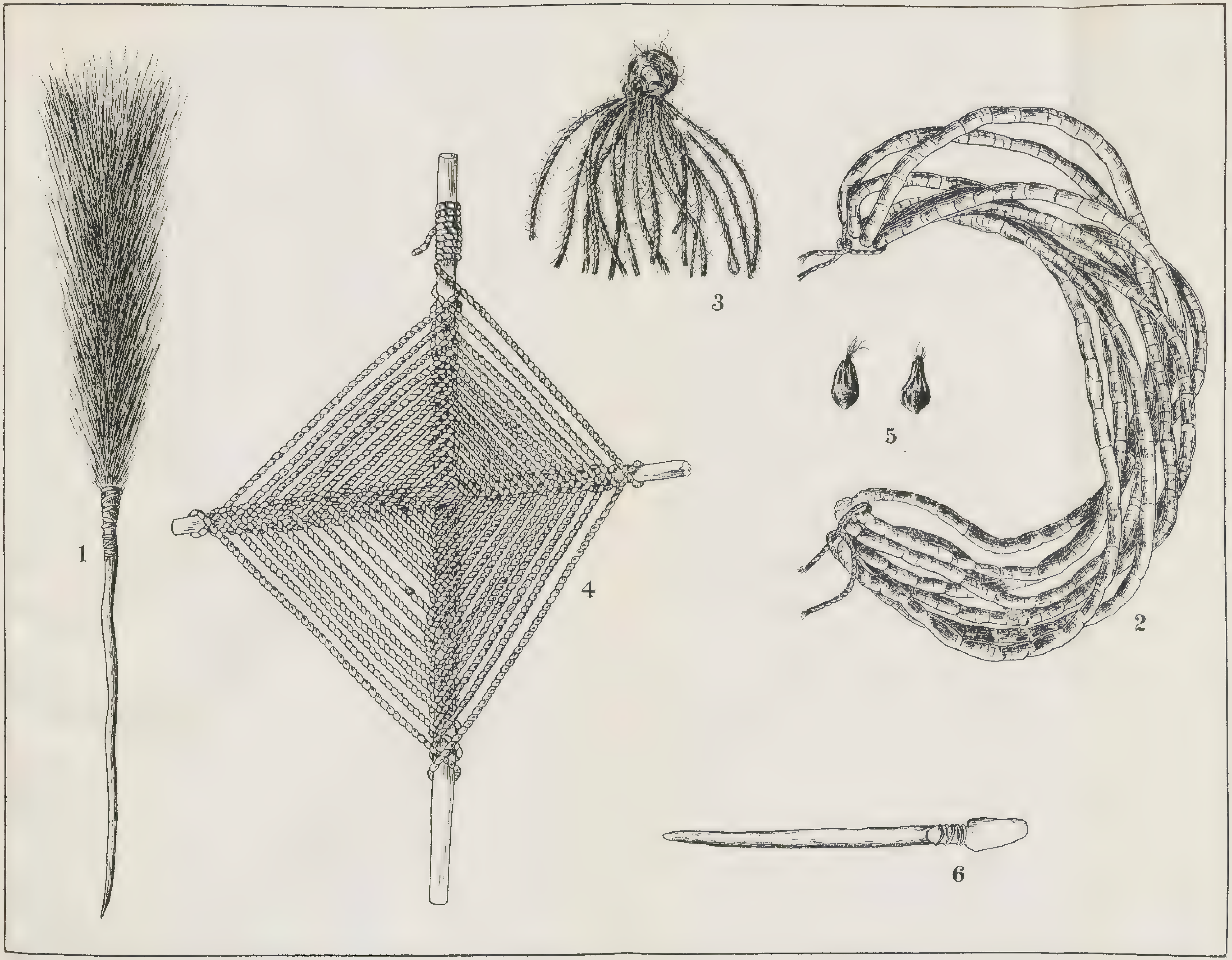

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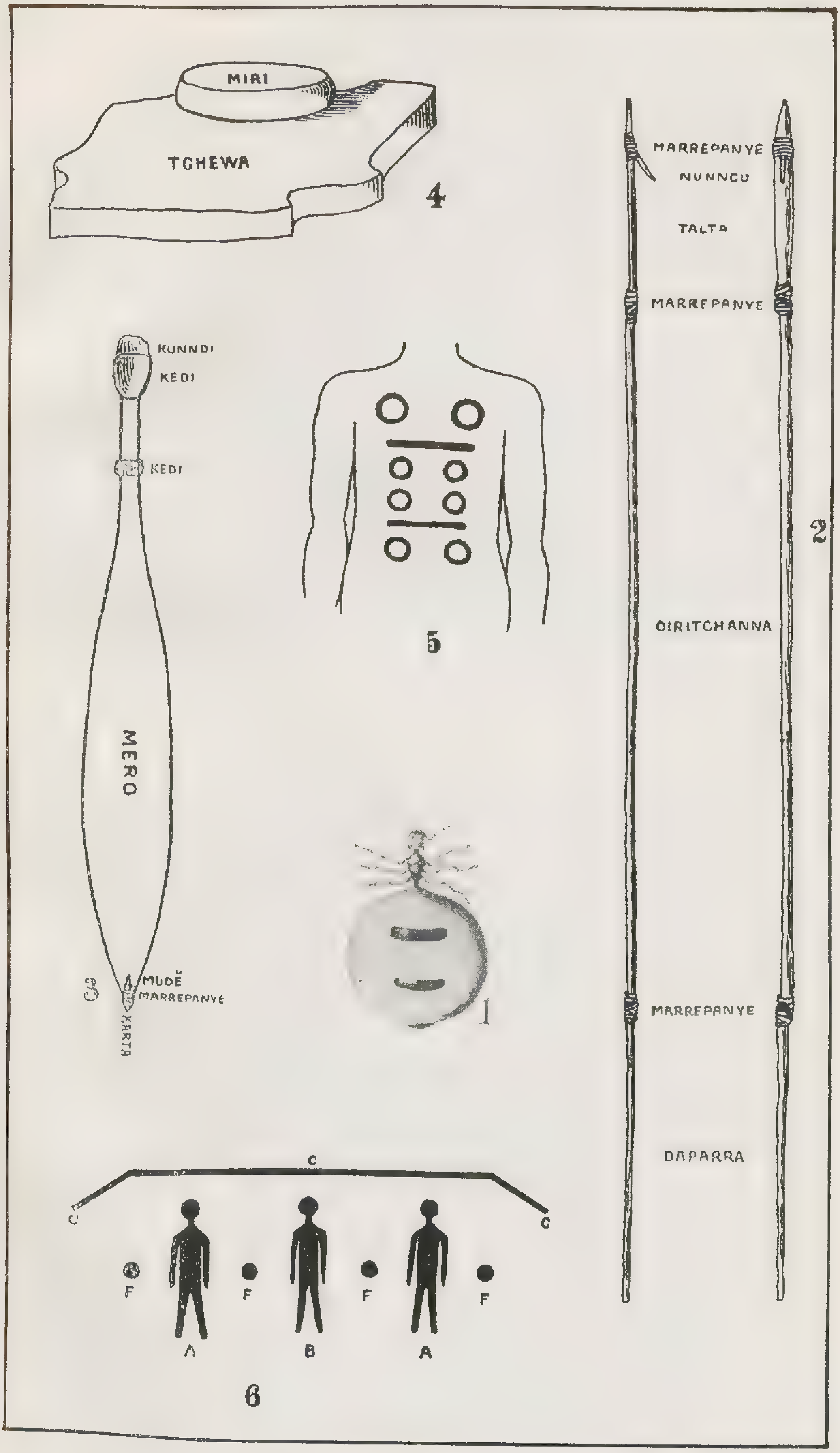

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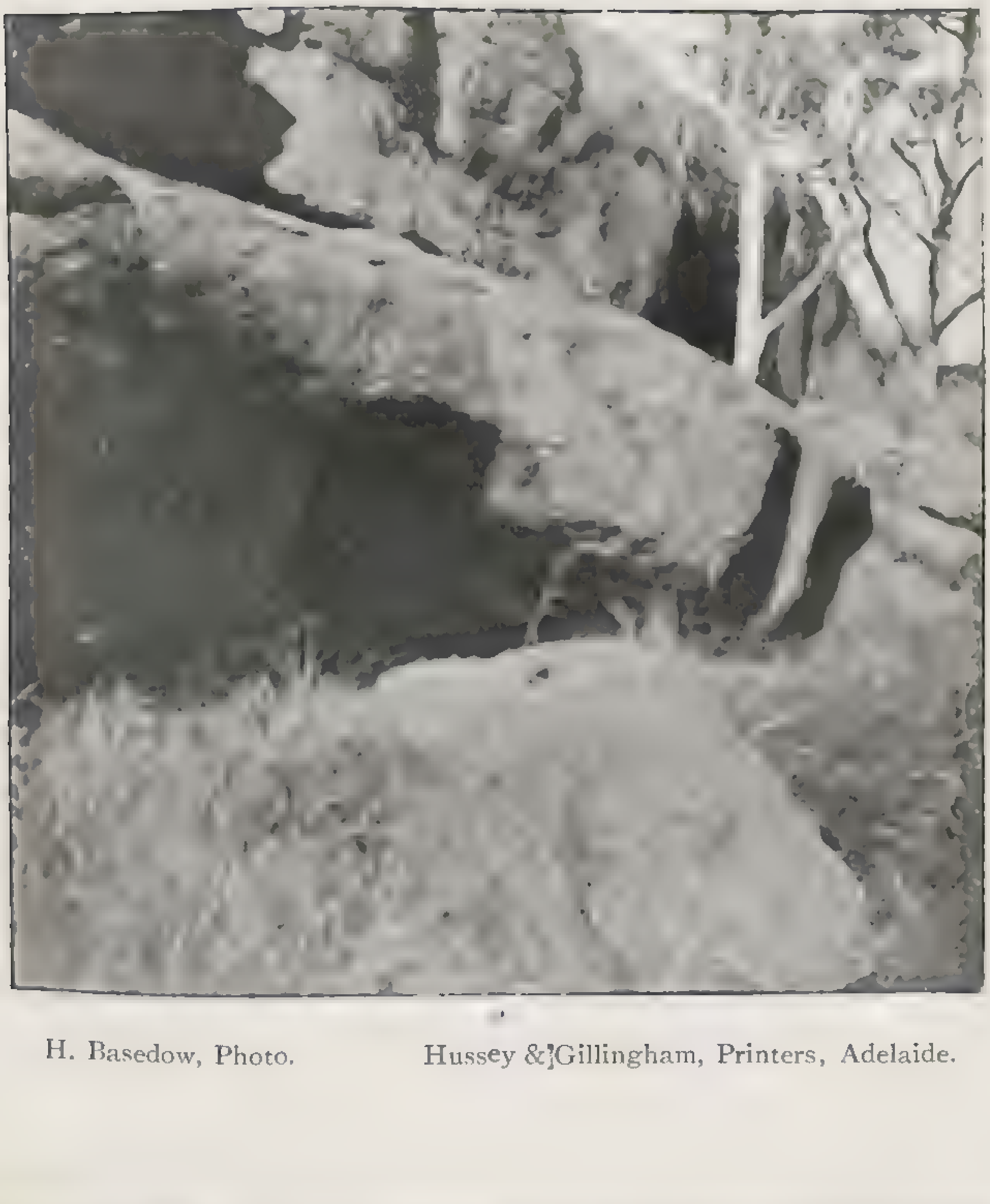

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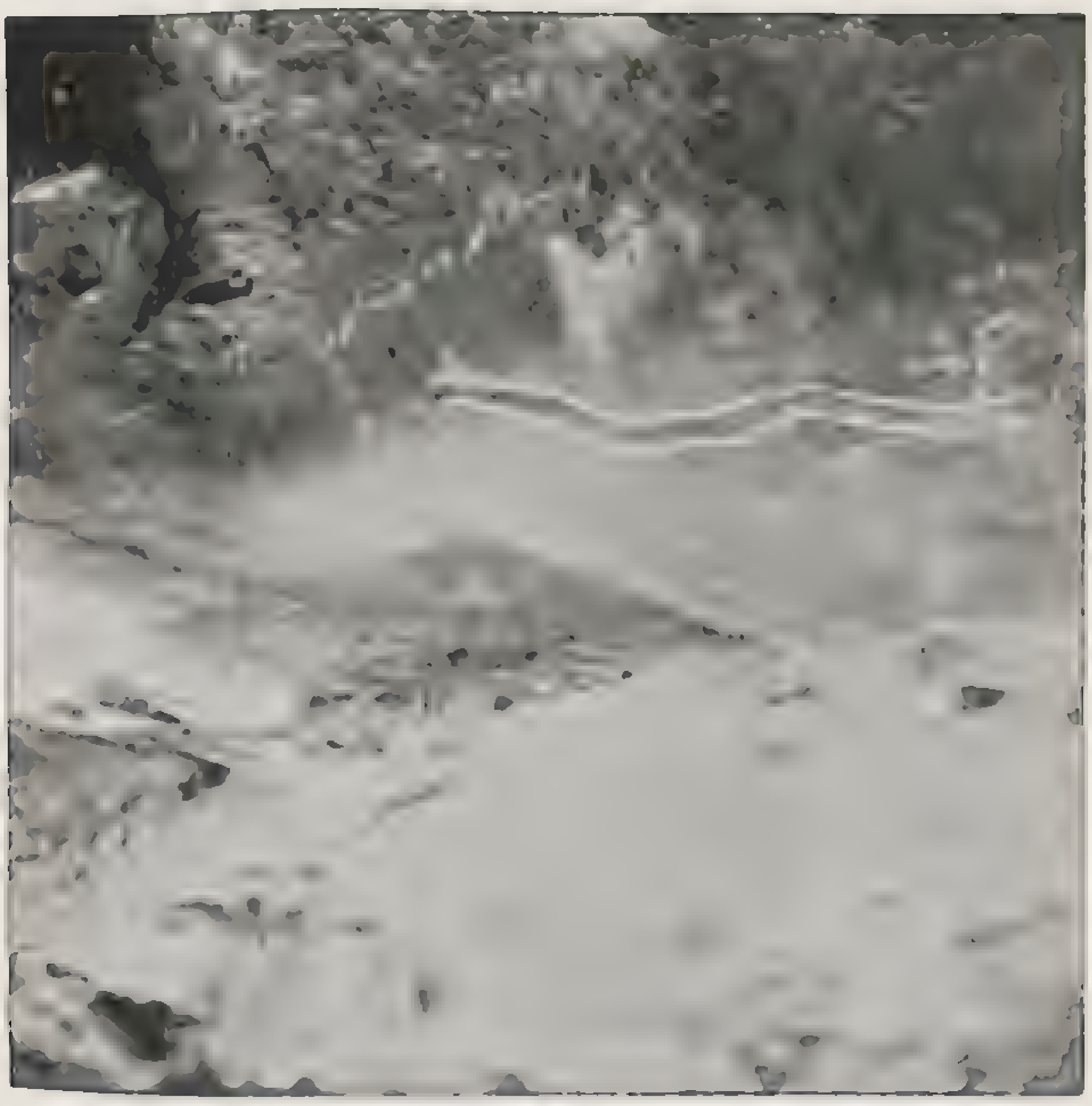

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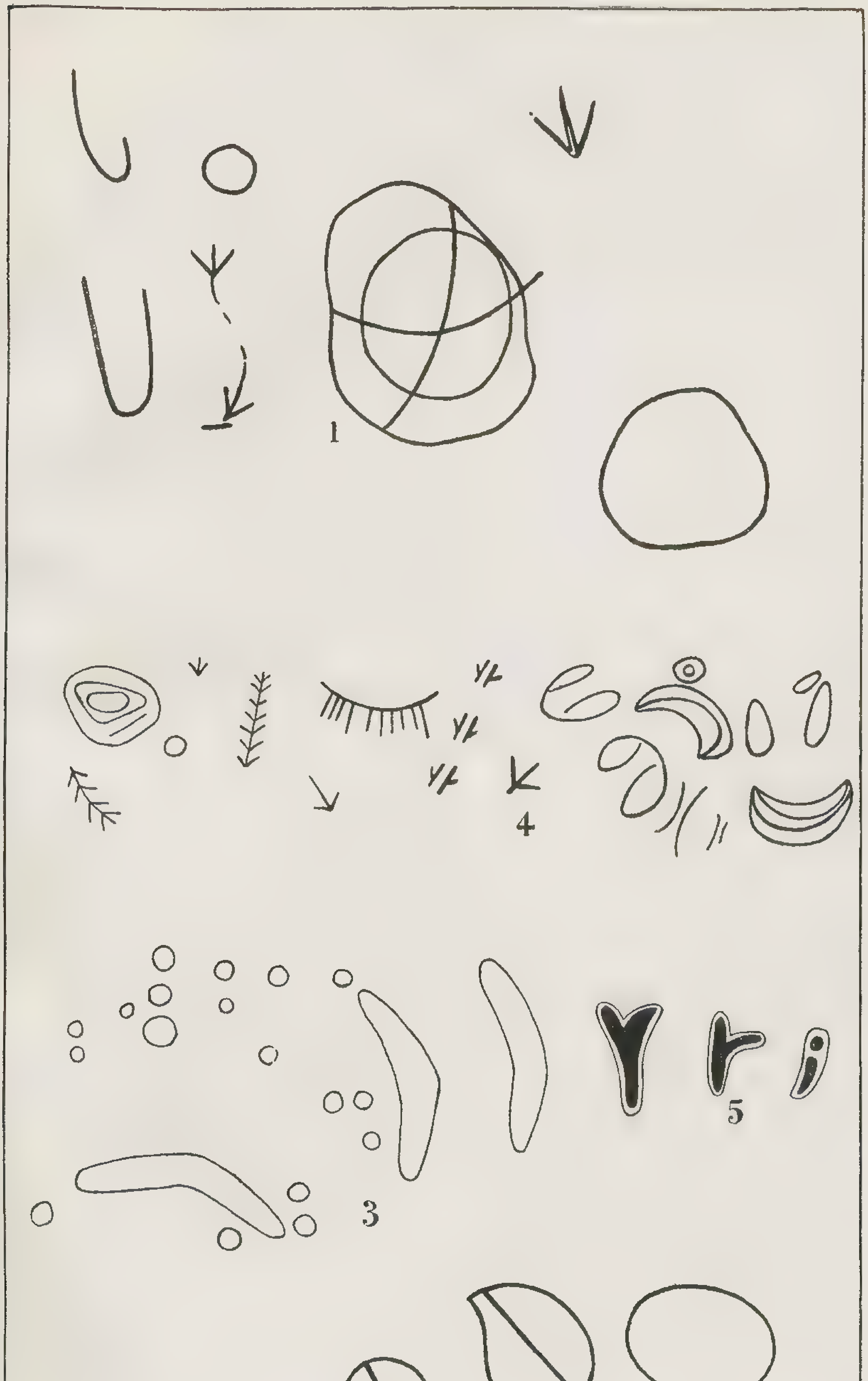

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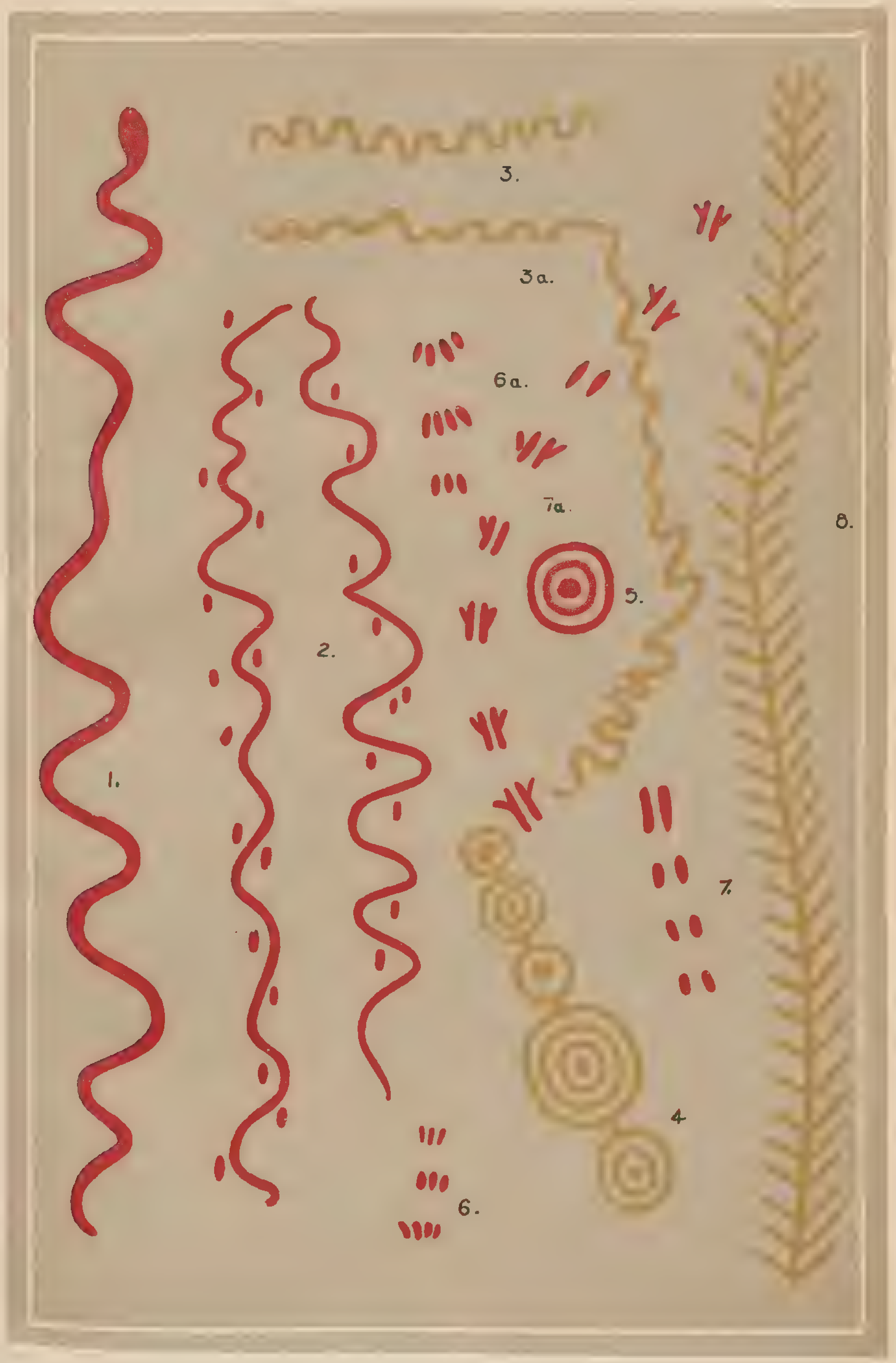

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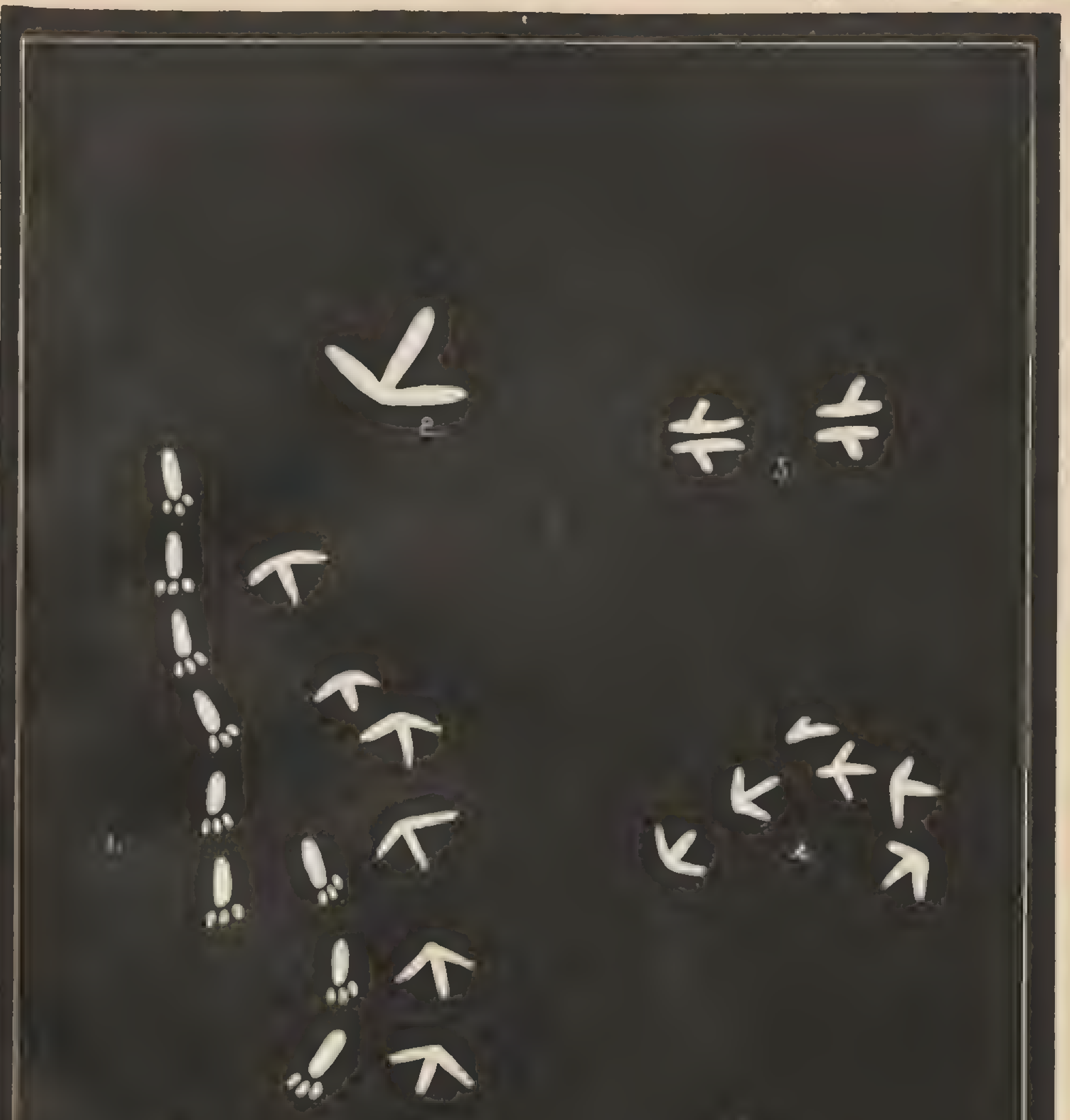

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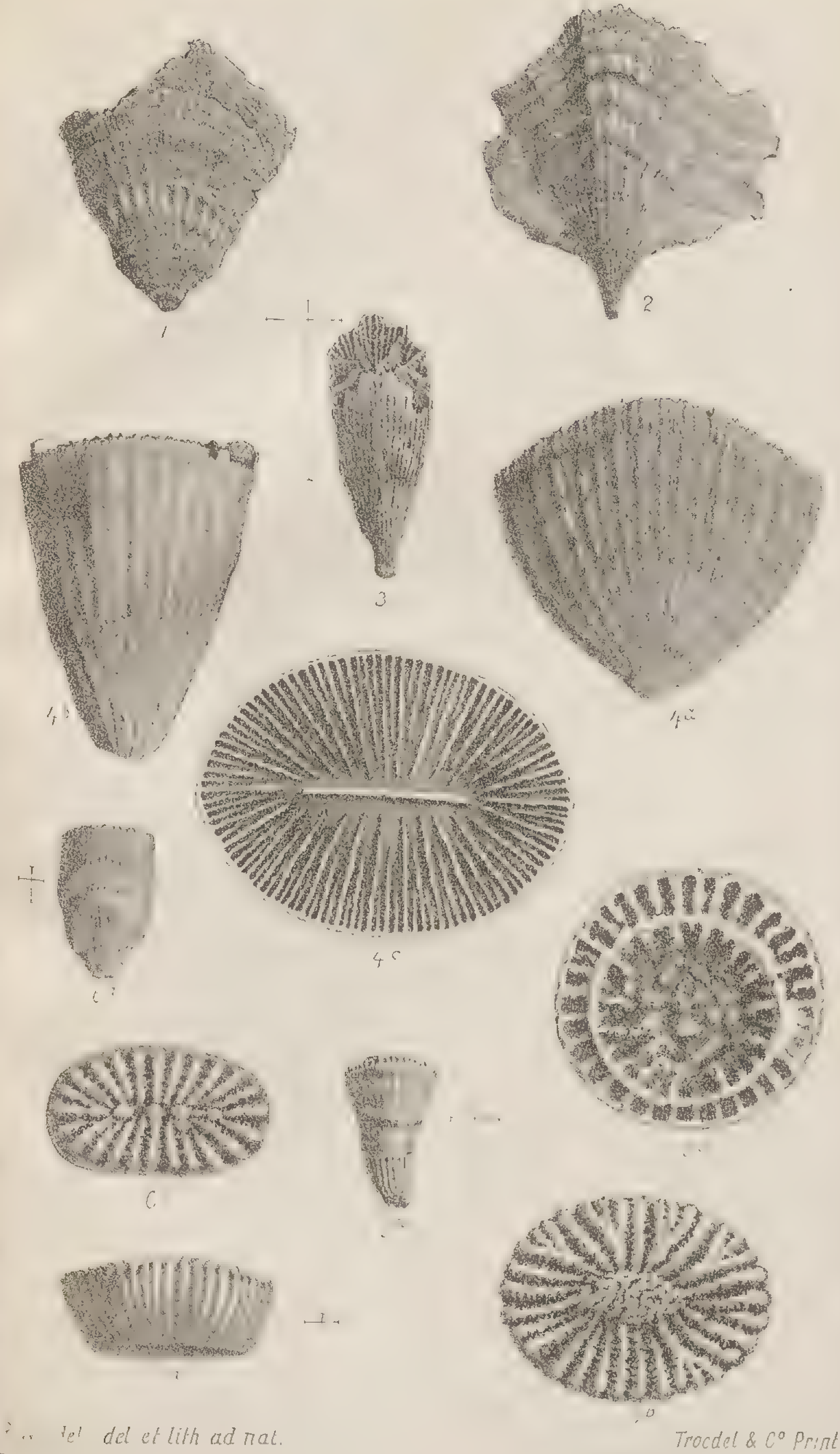

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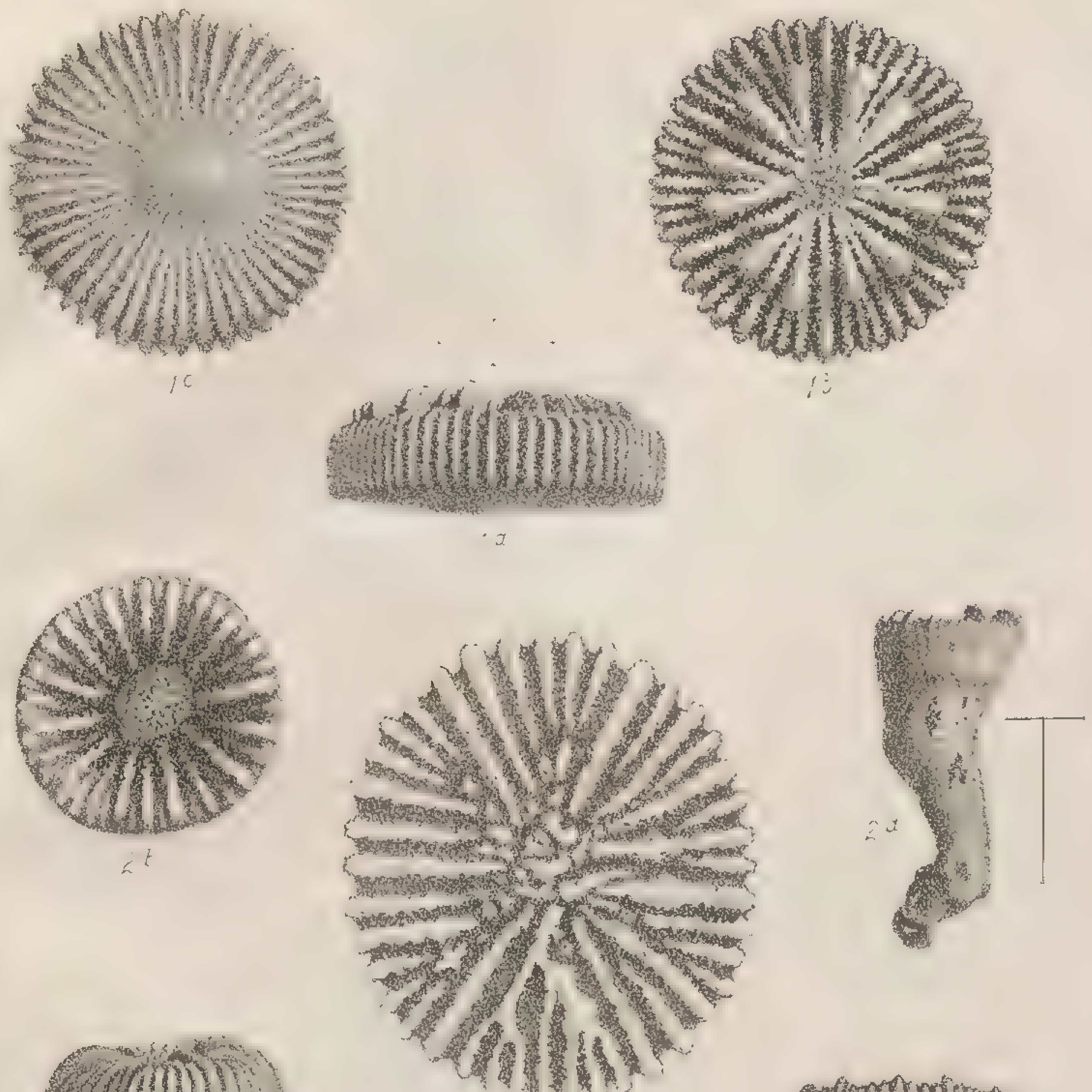

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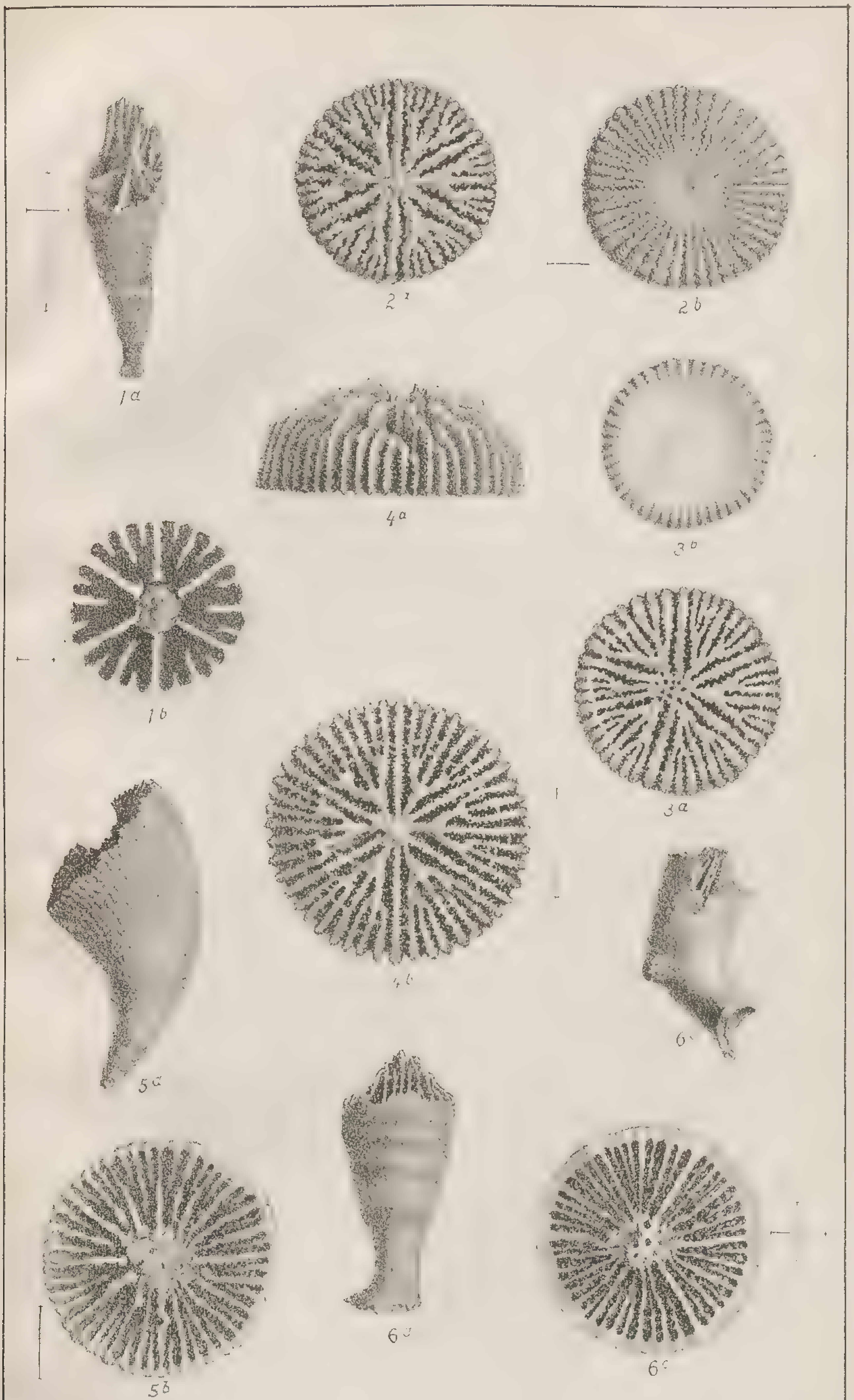

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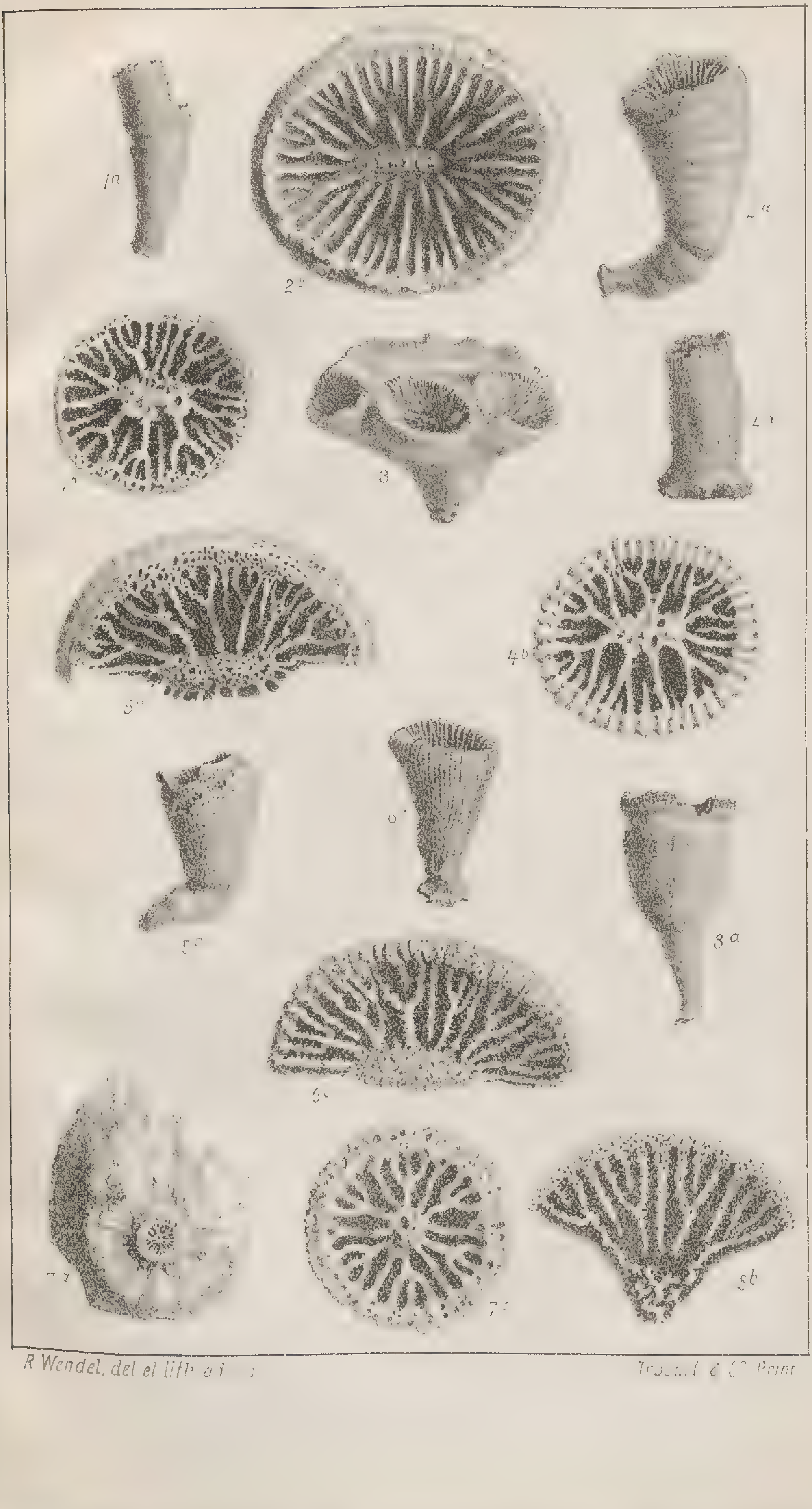

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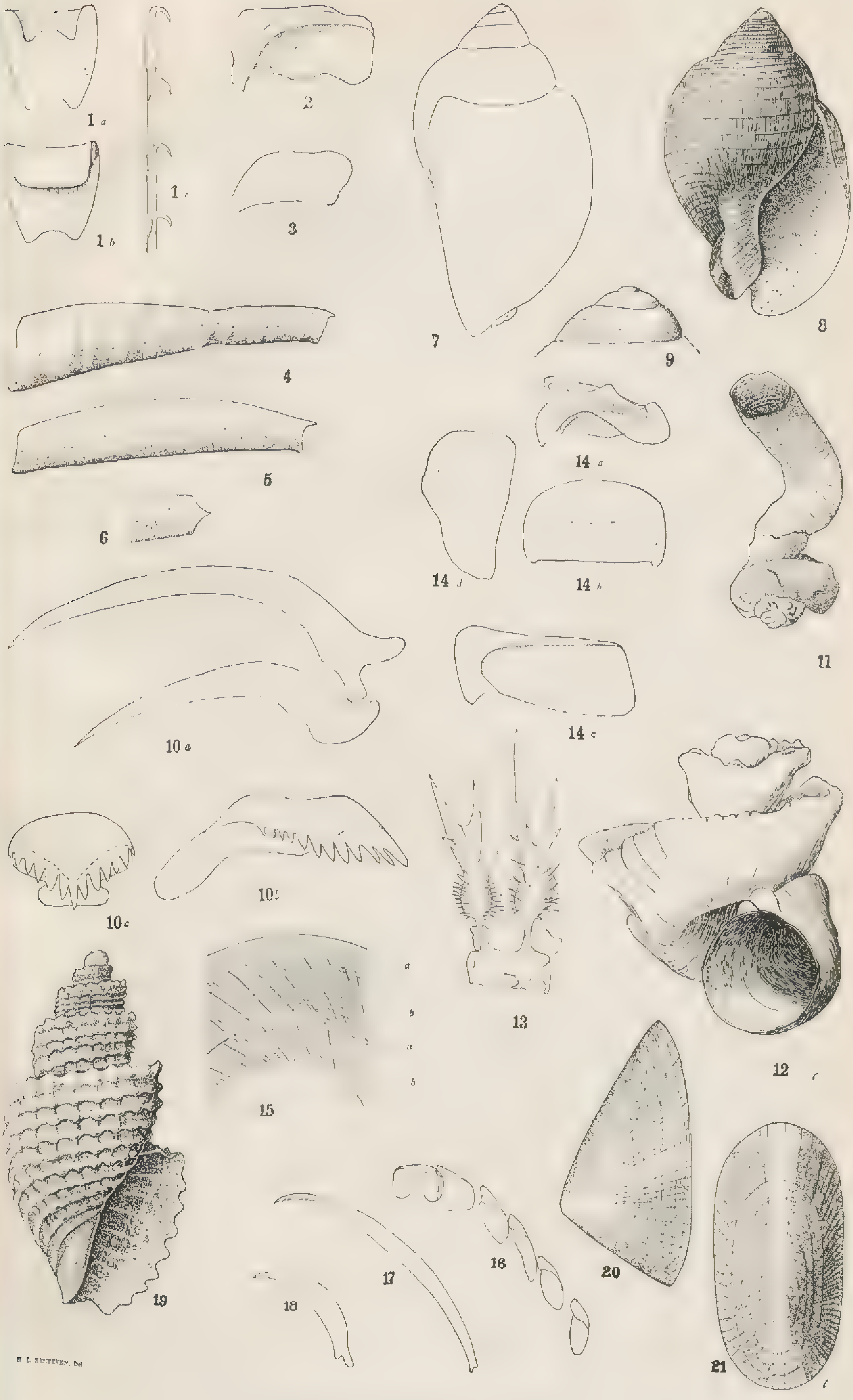

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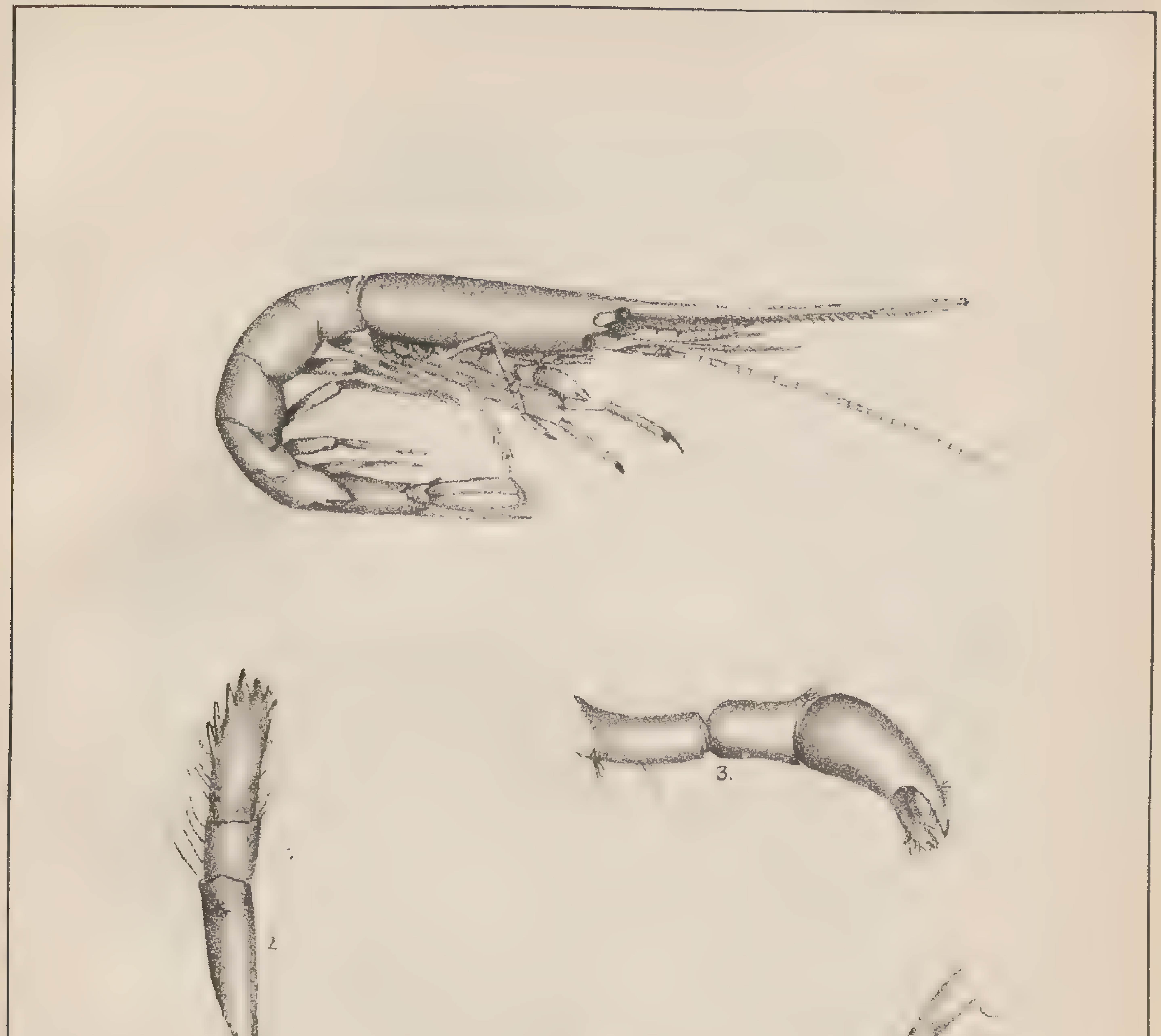

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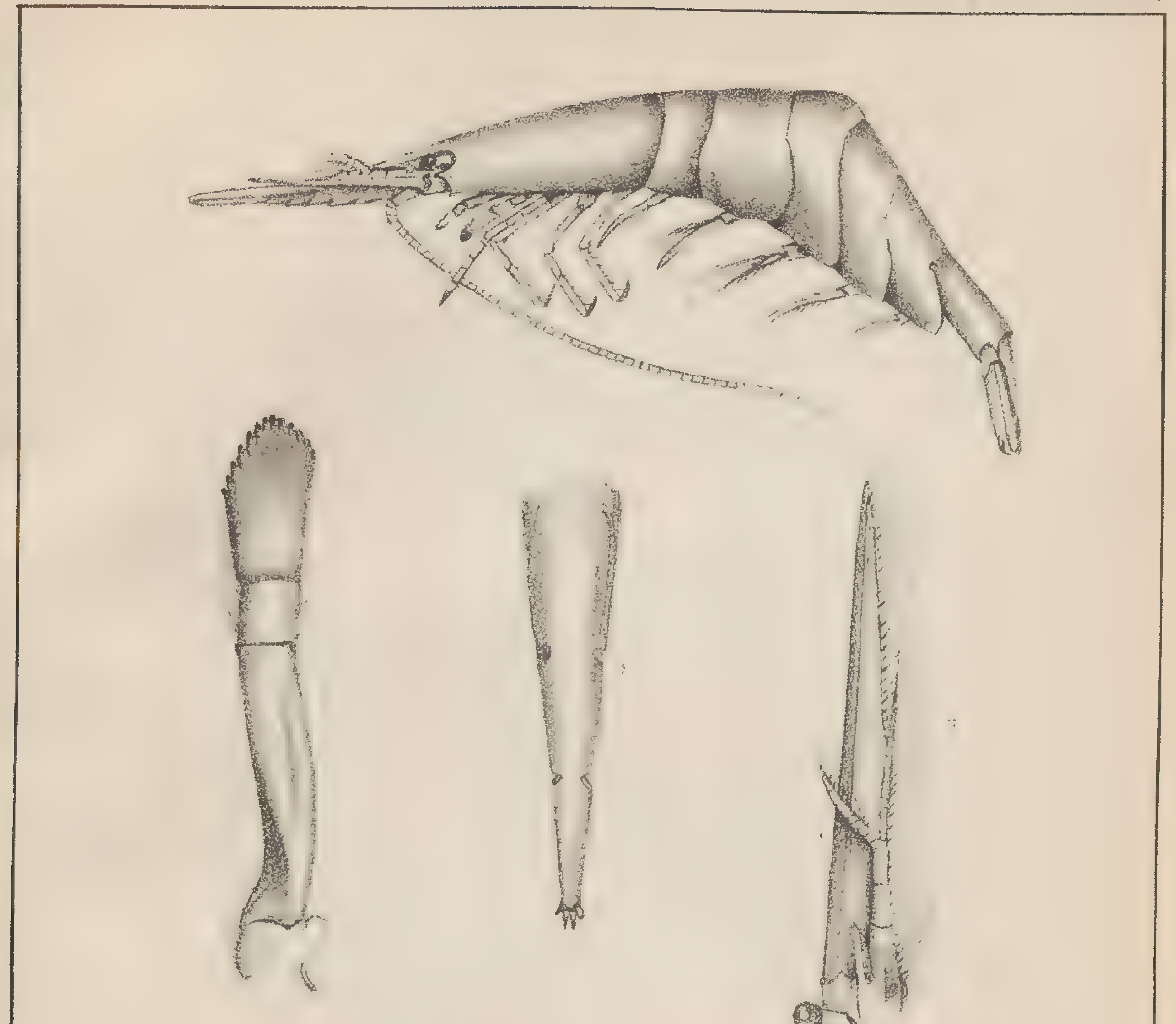

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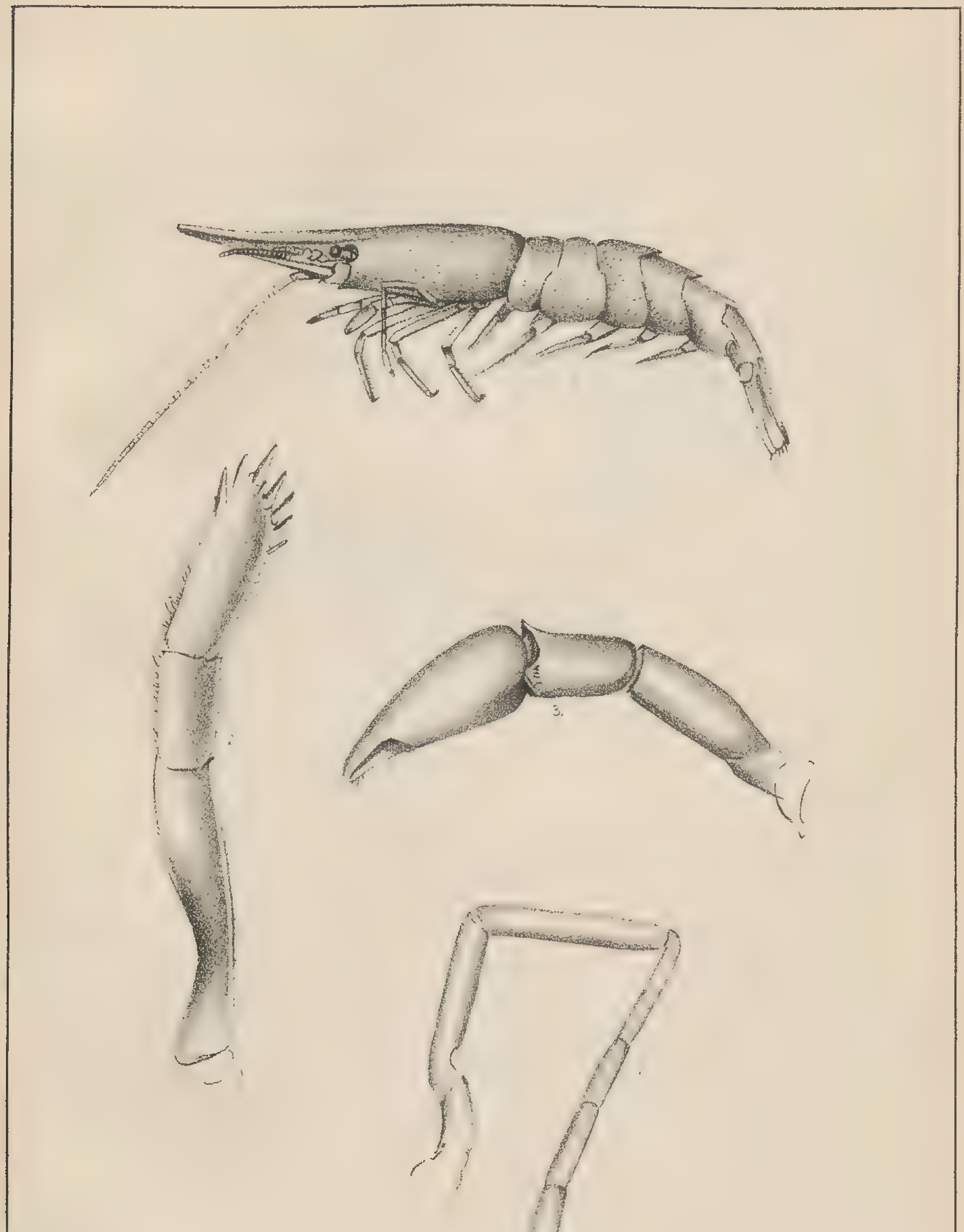

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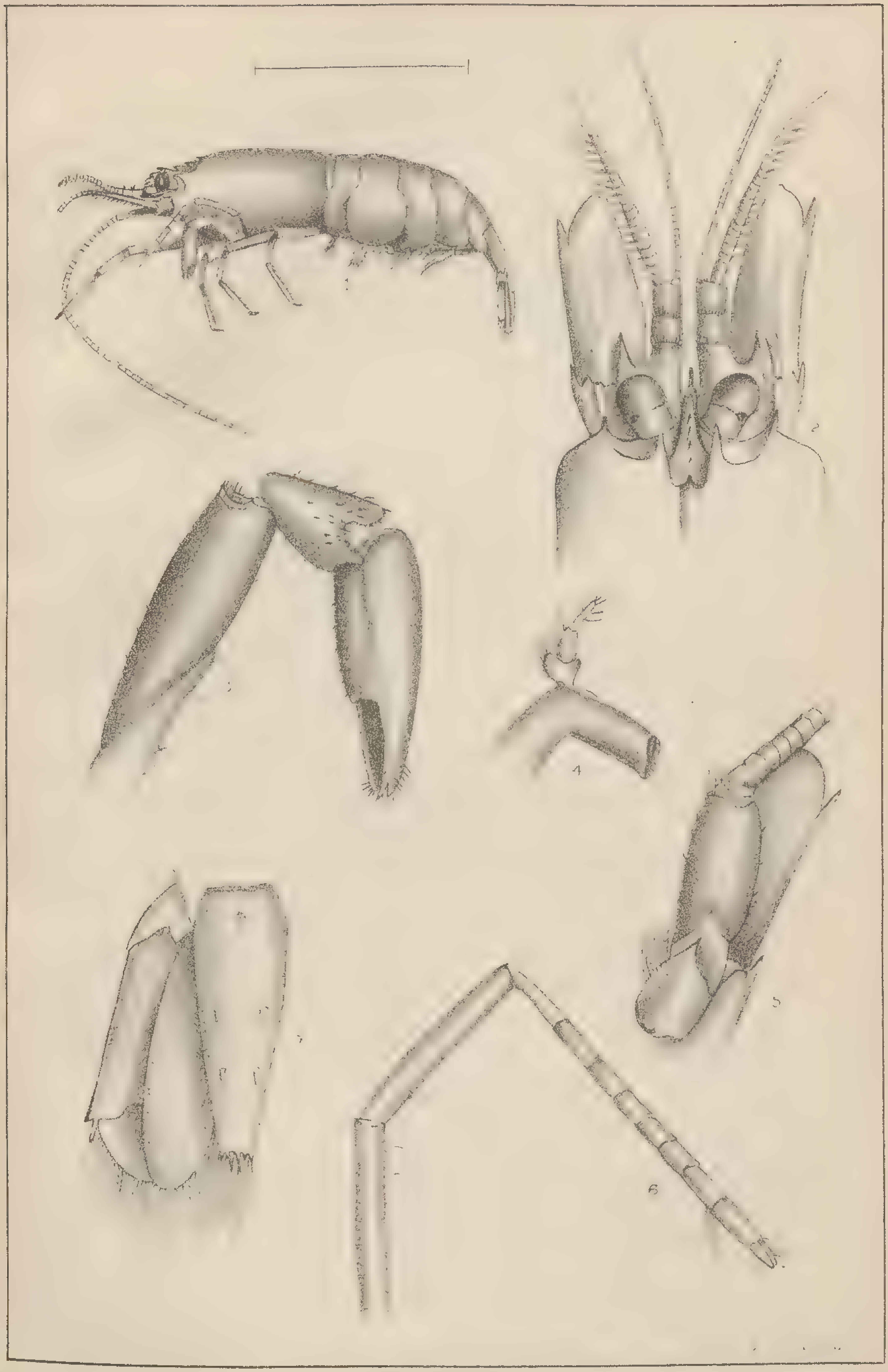

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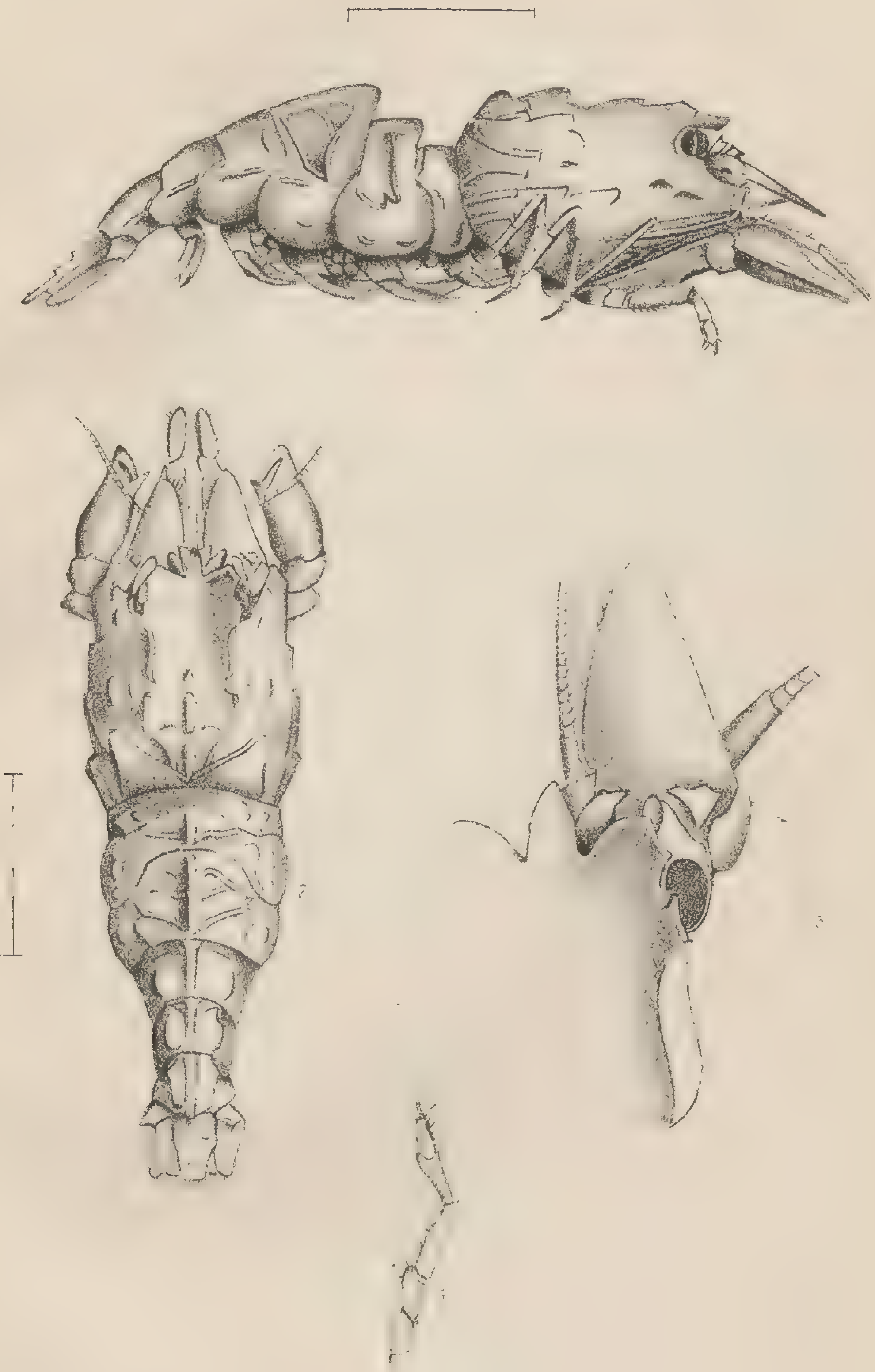

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VERCOIA GIBBOSA.

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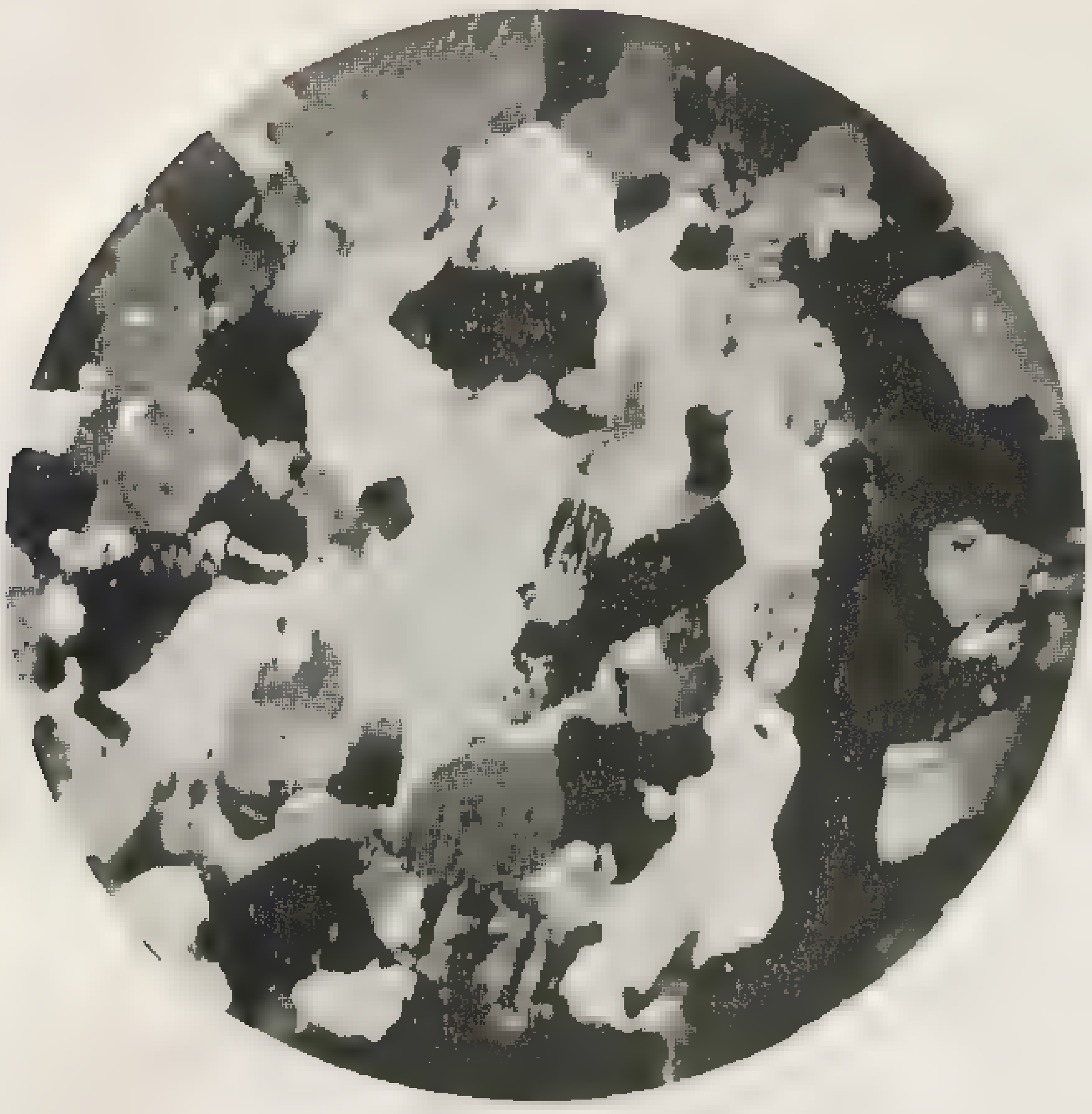

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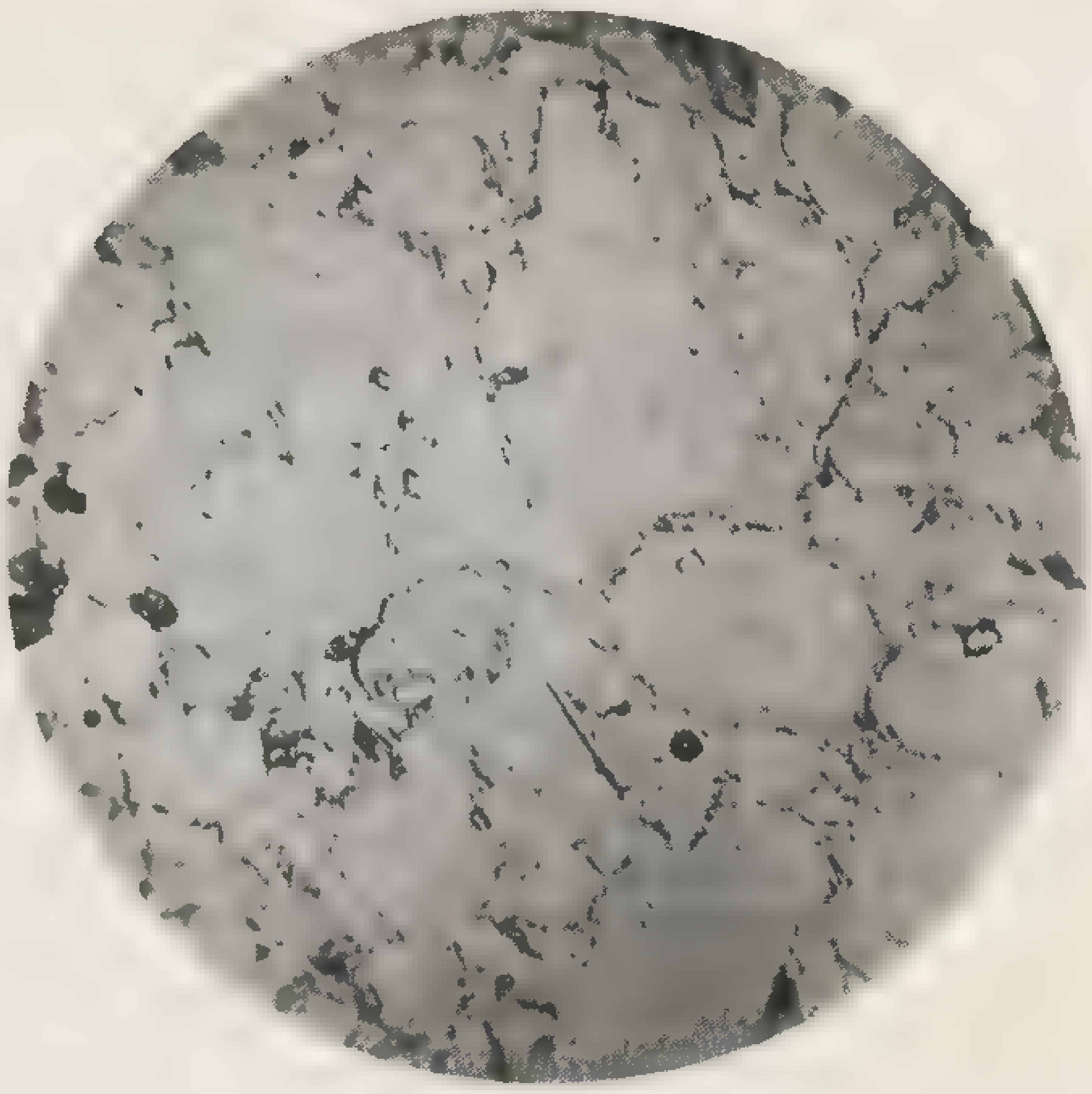

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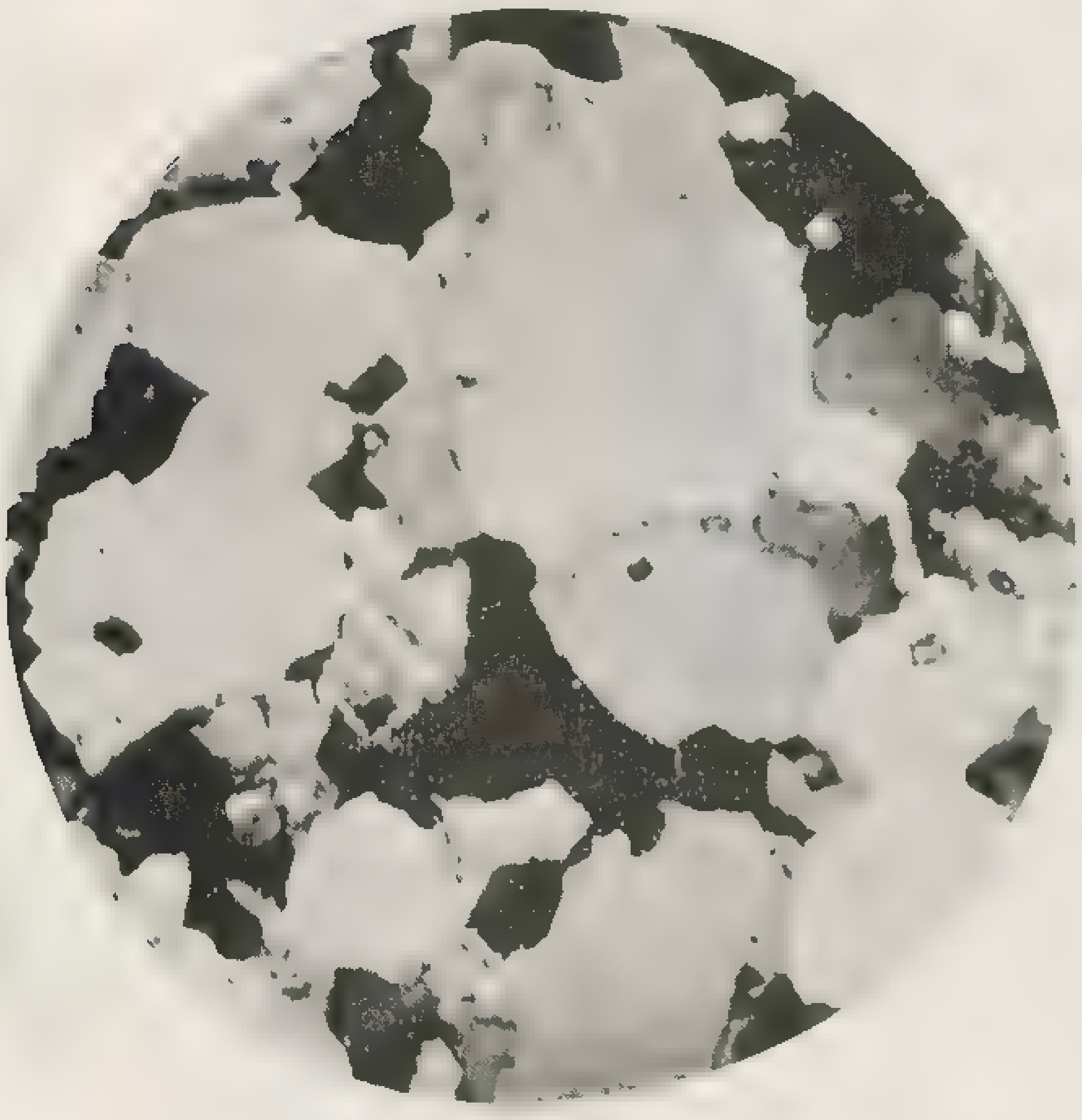

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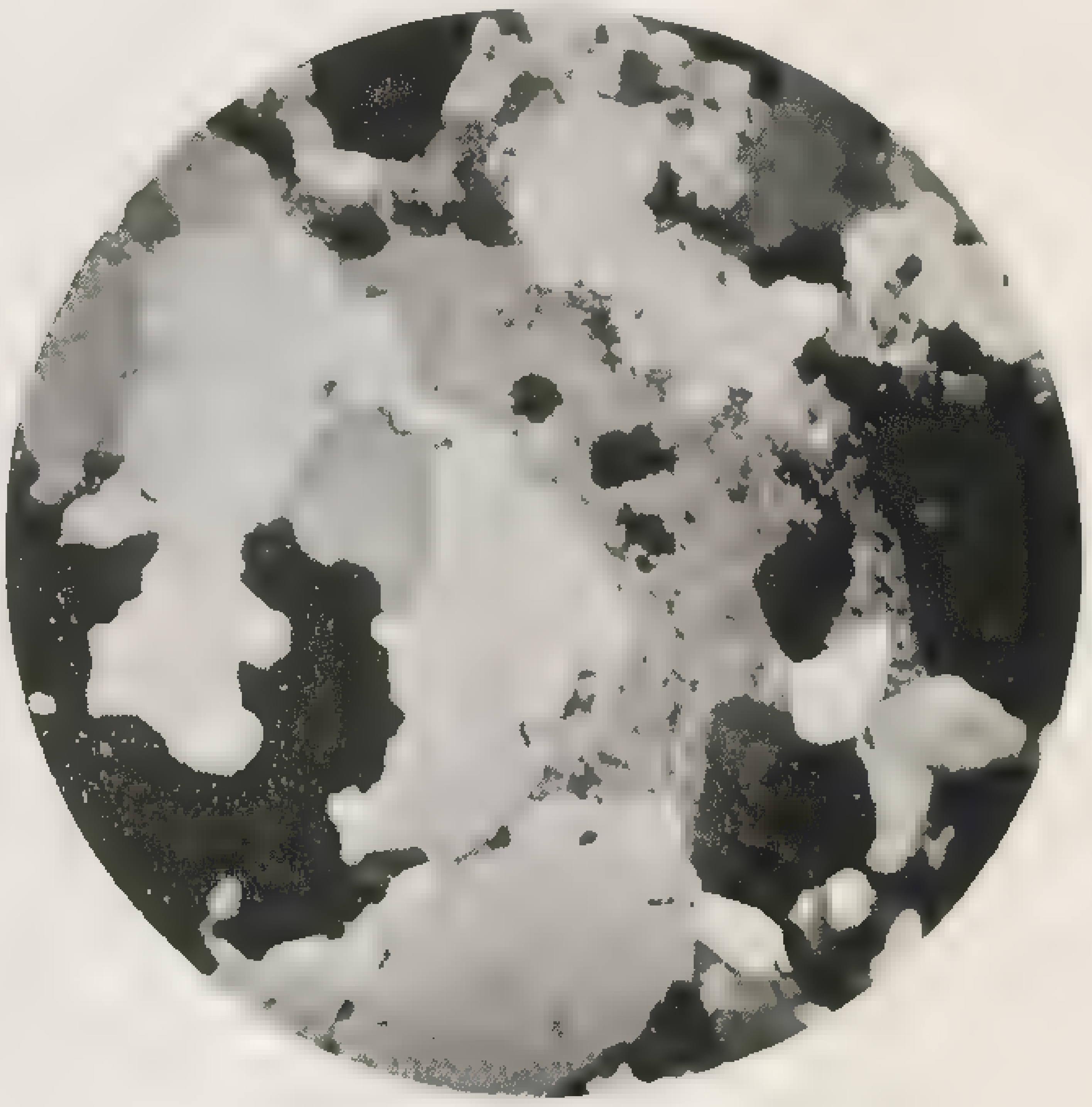

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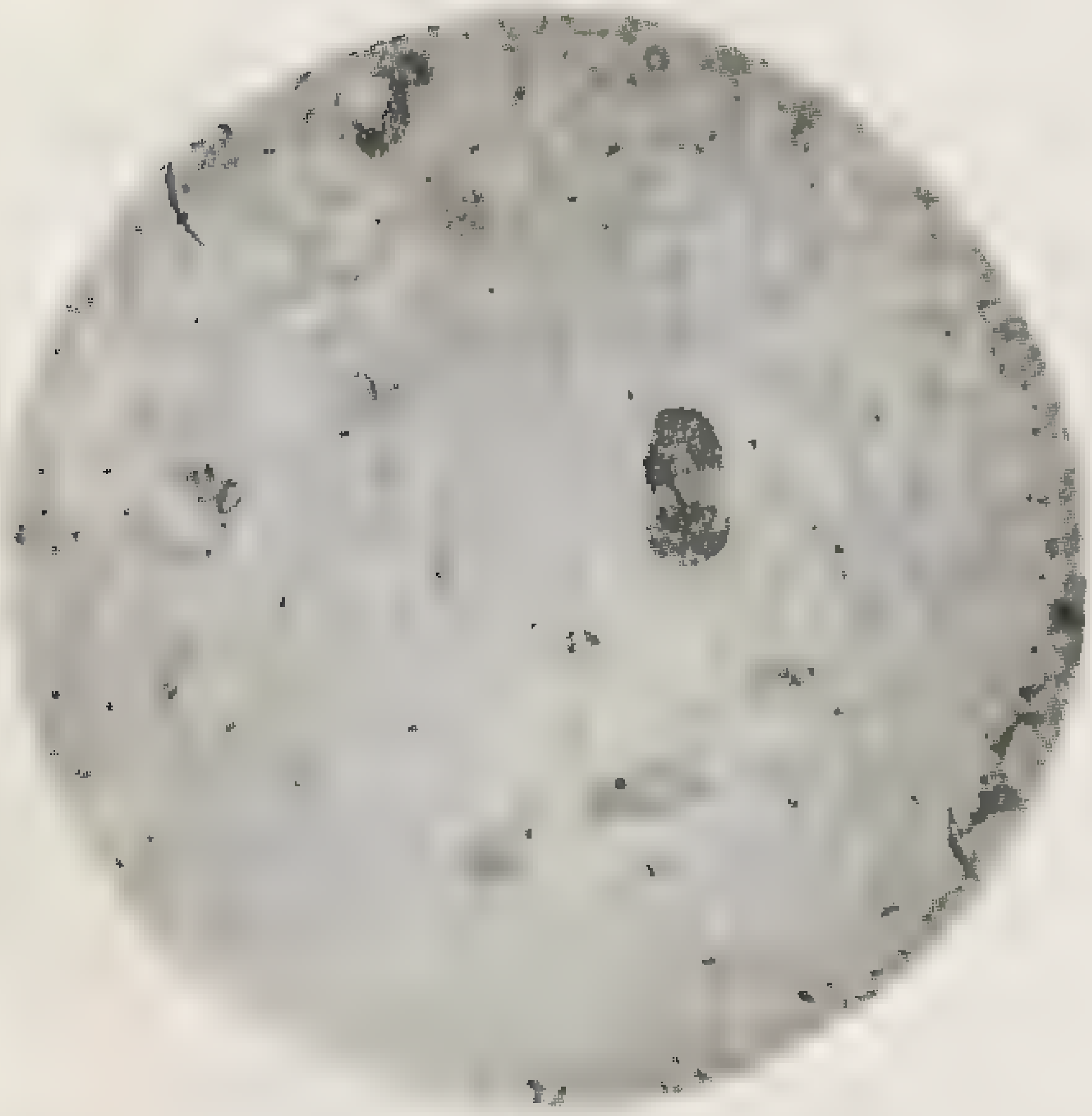

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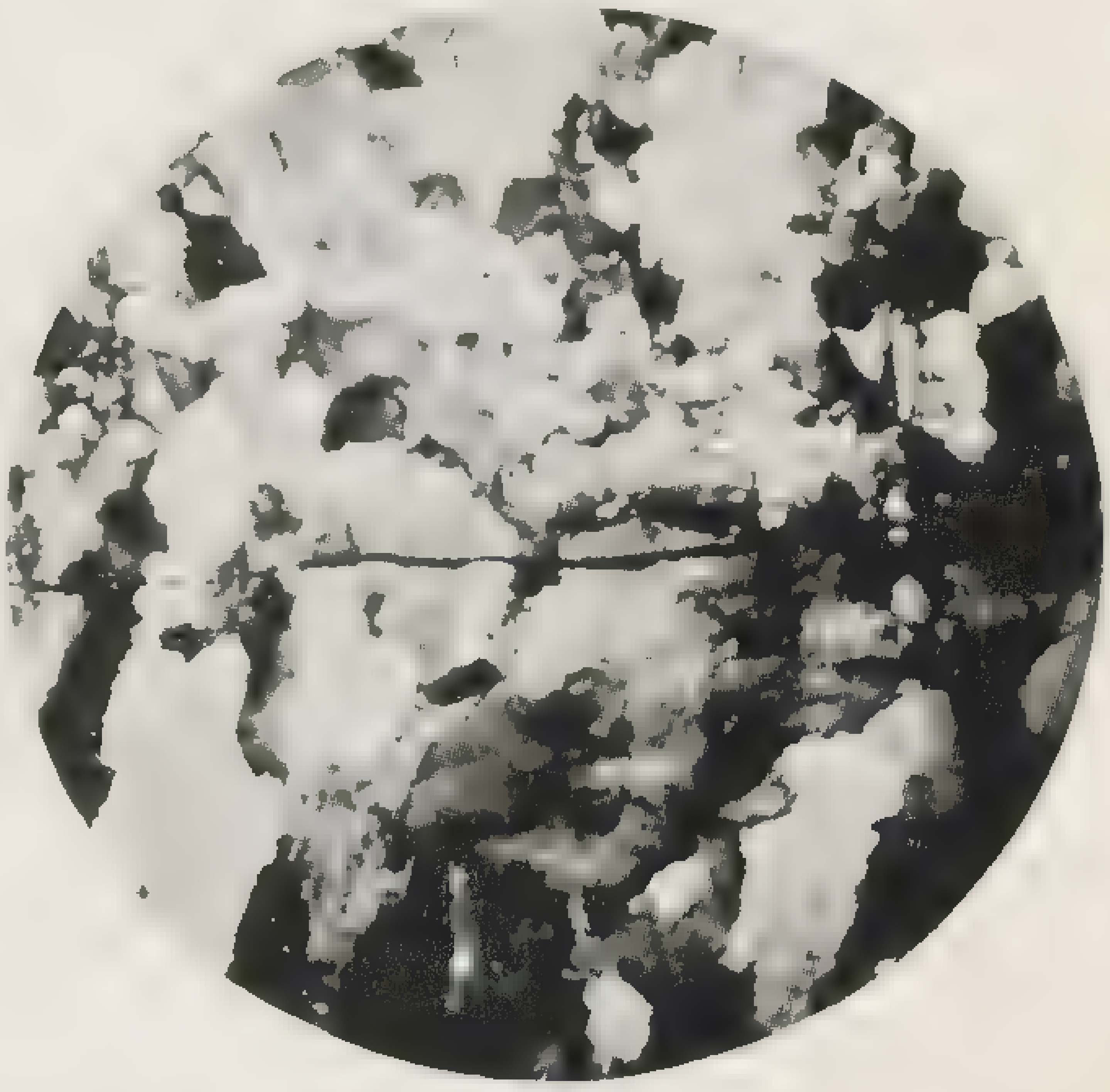

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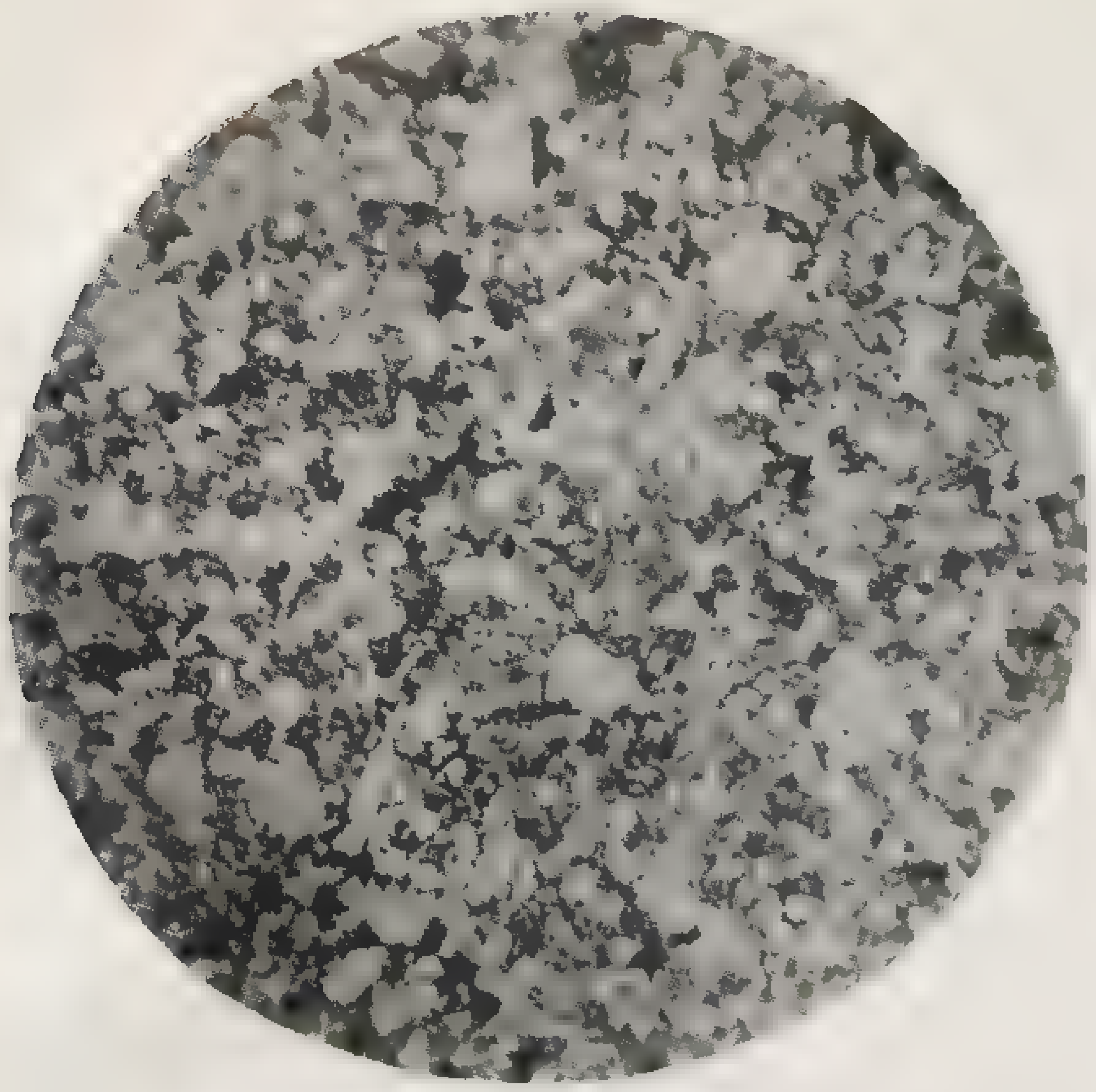

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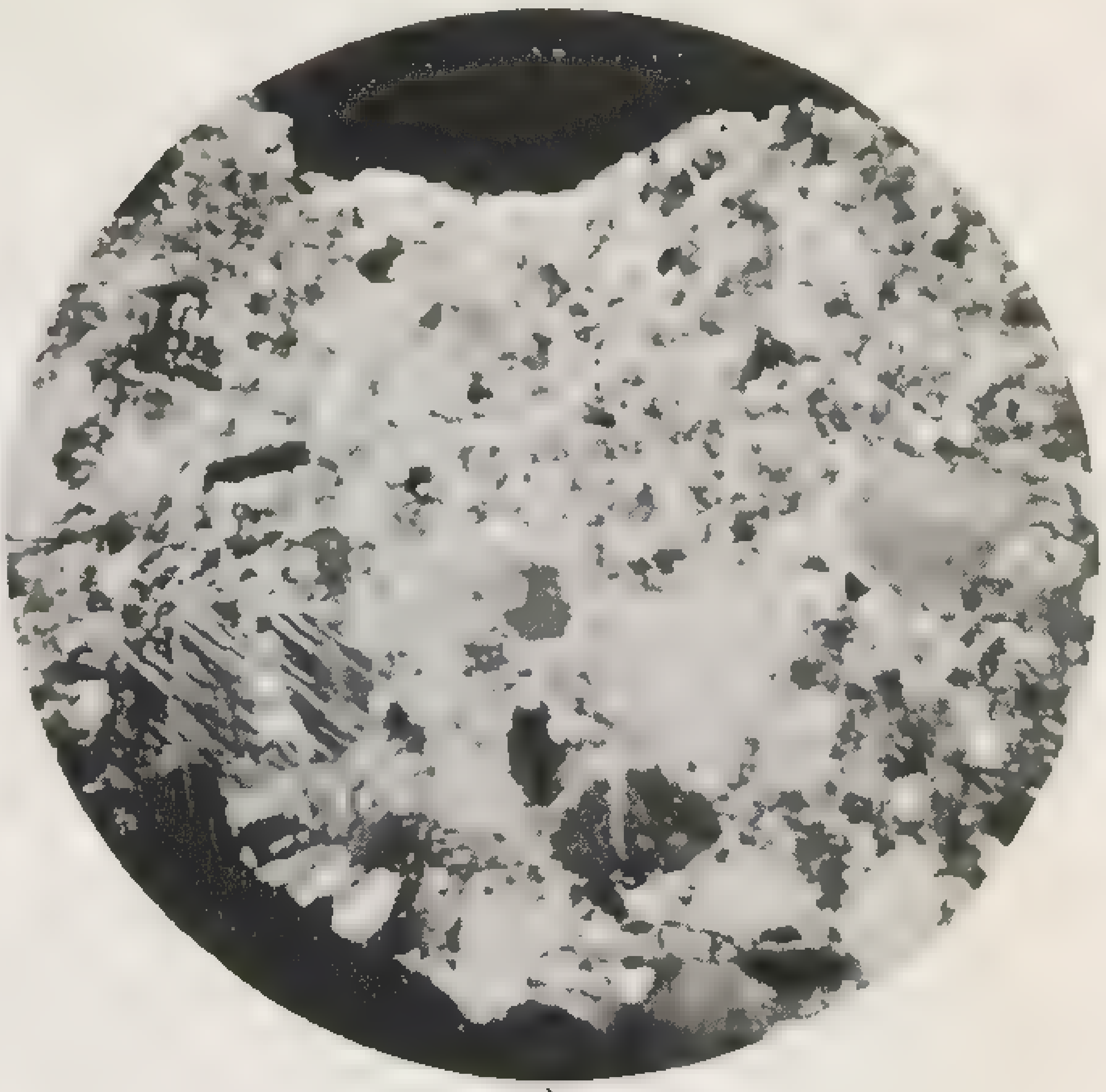

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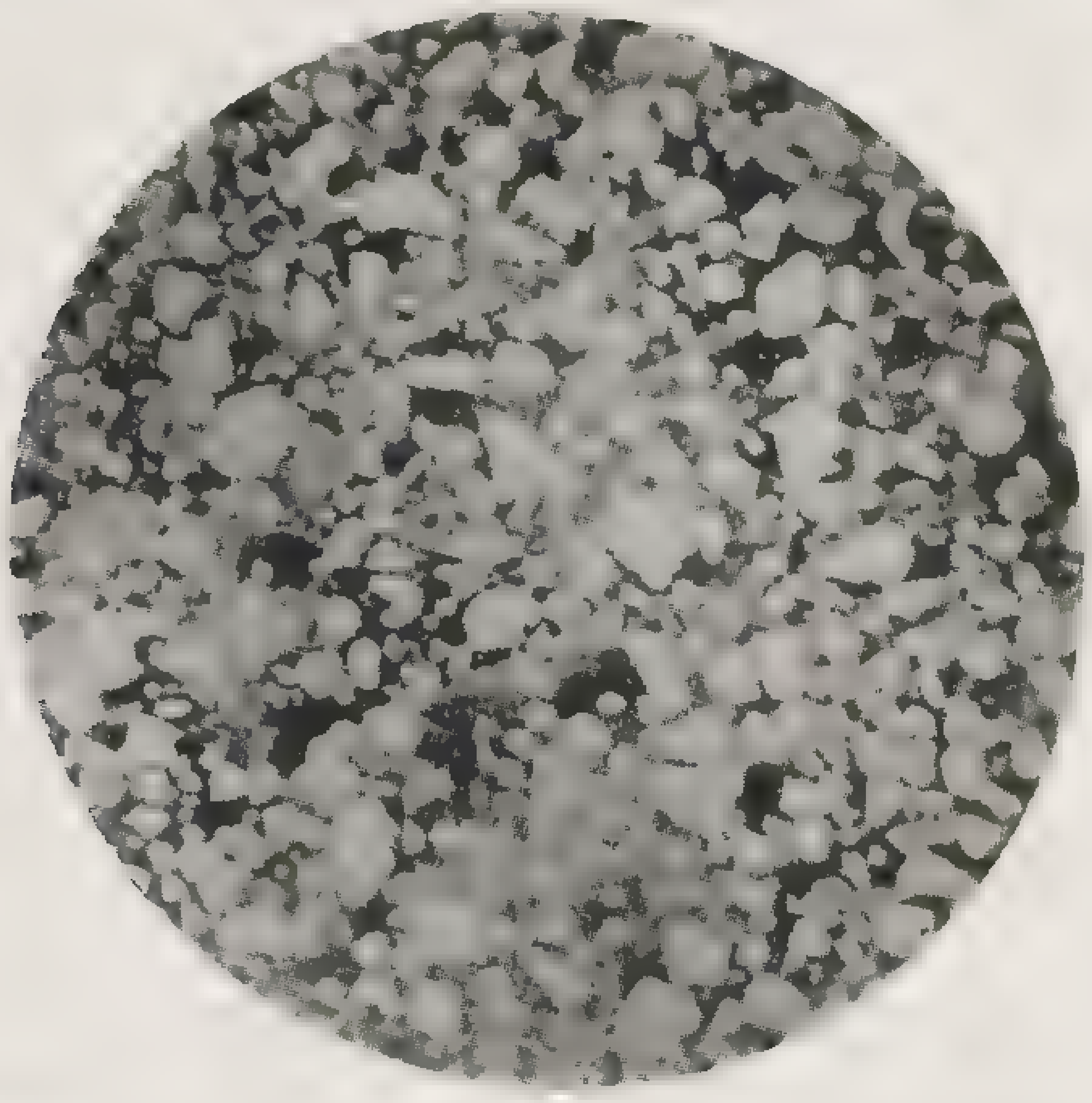

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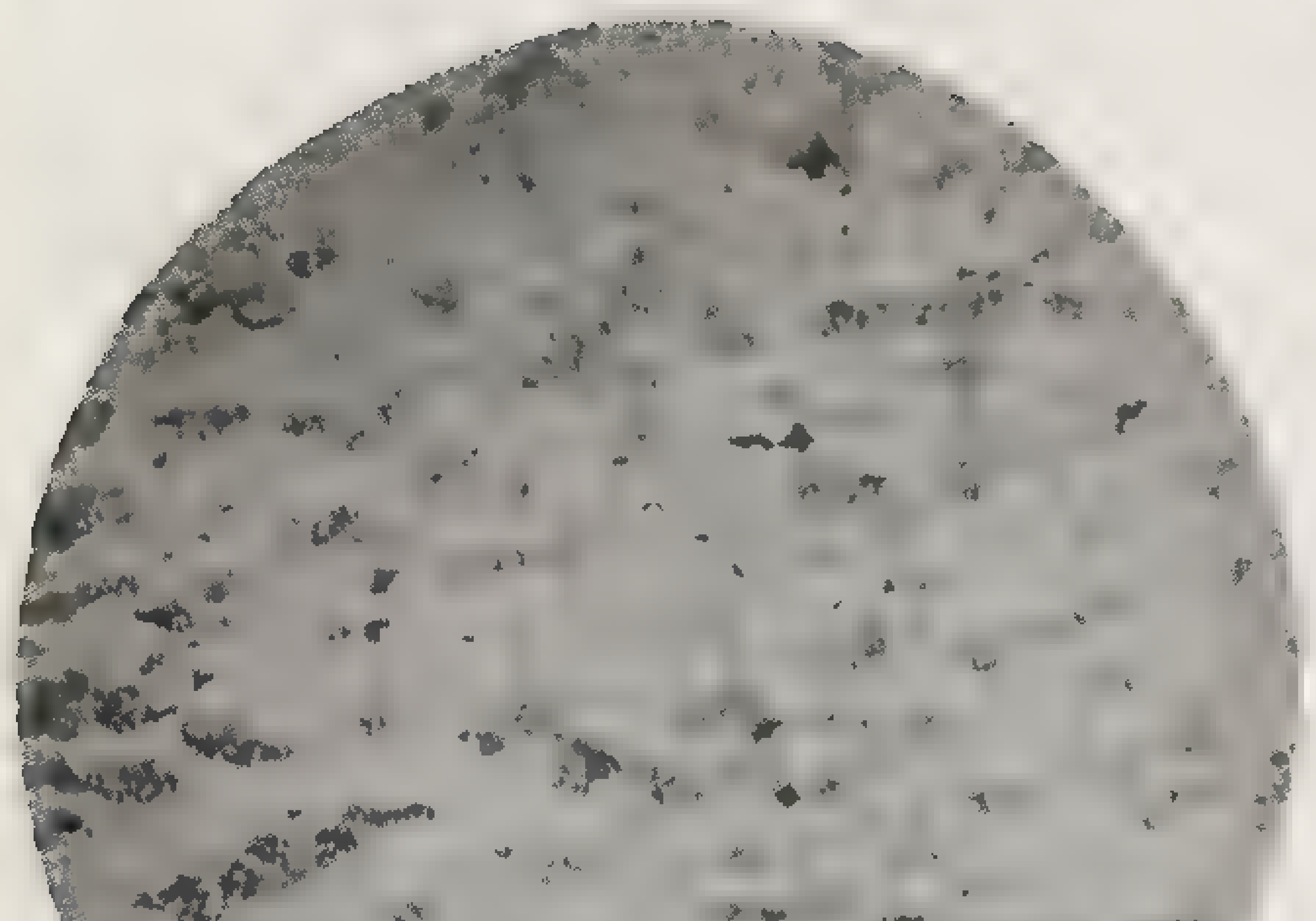

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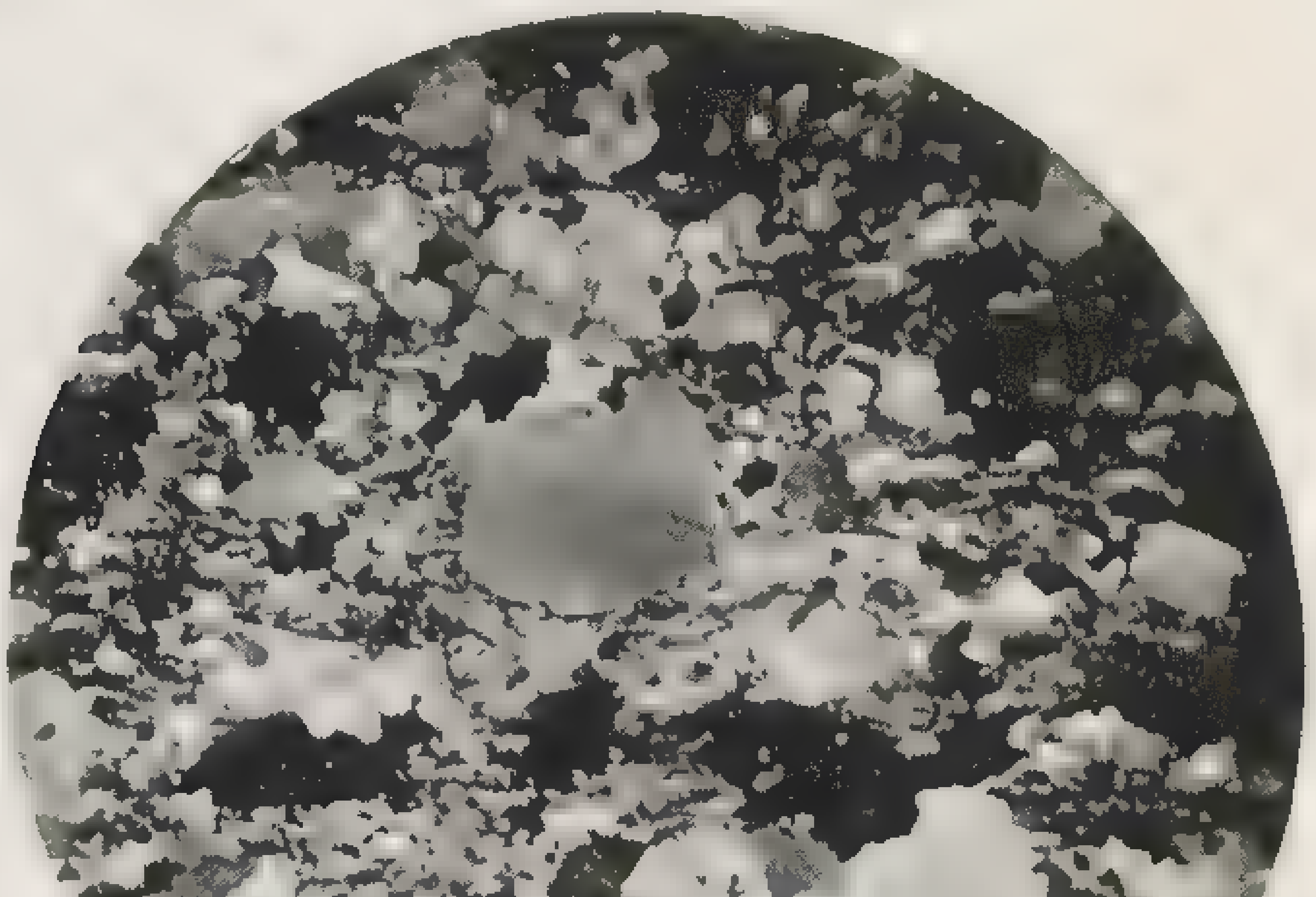

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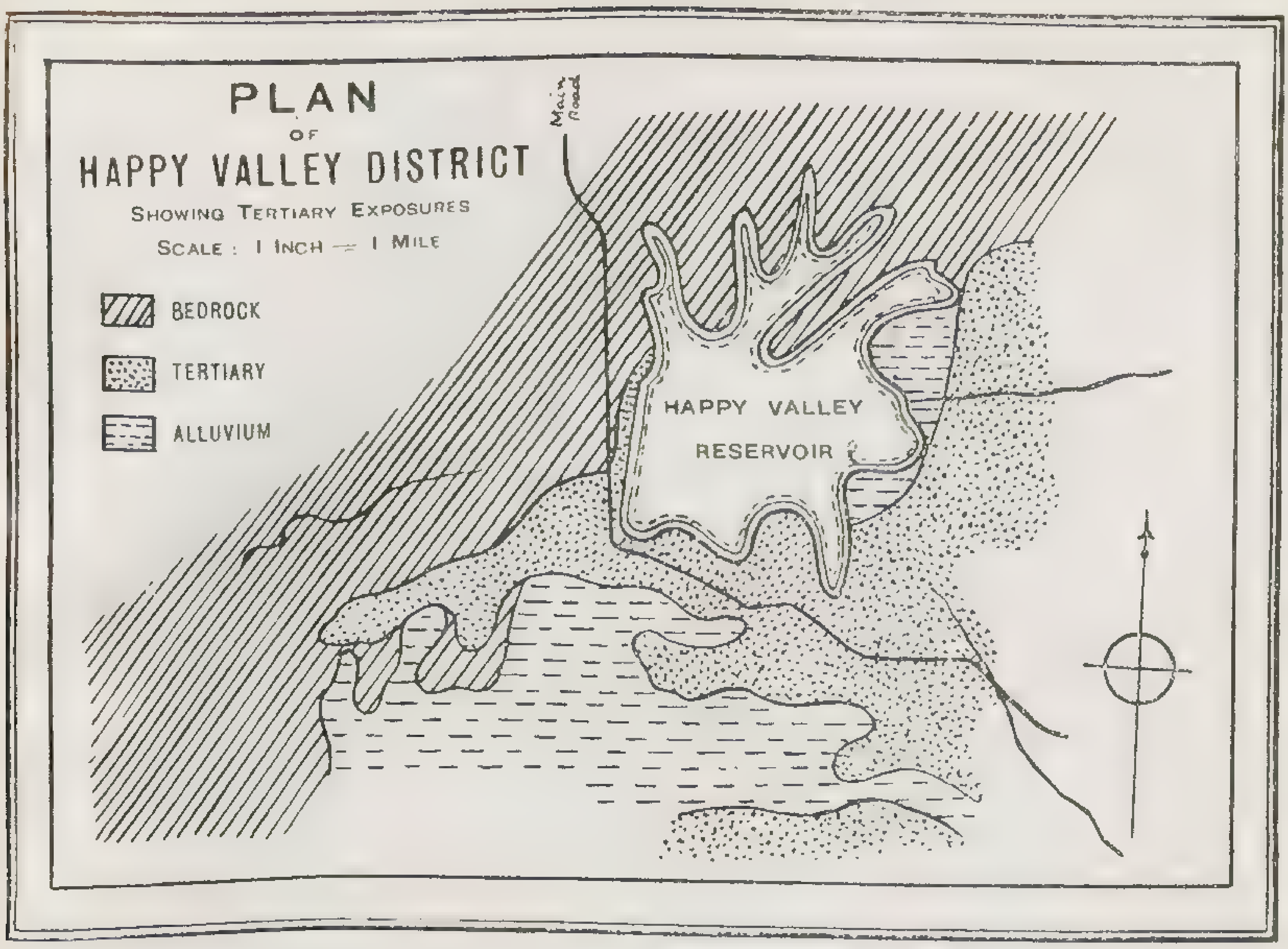

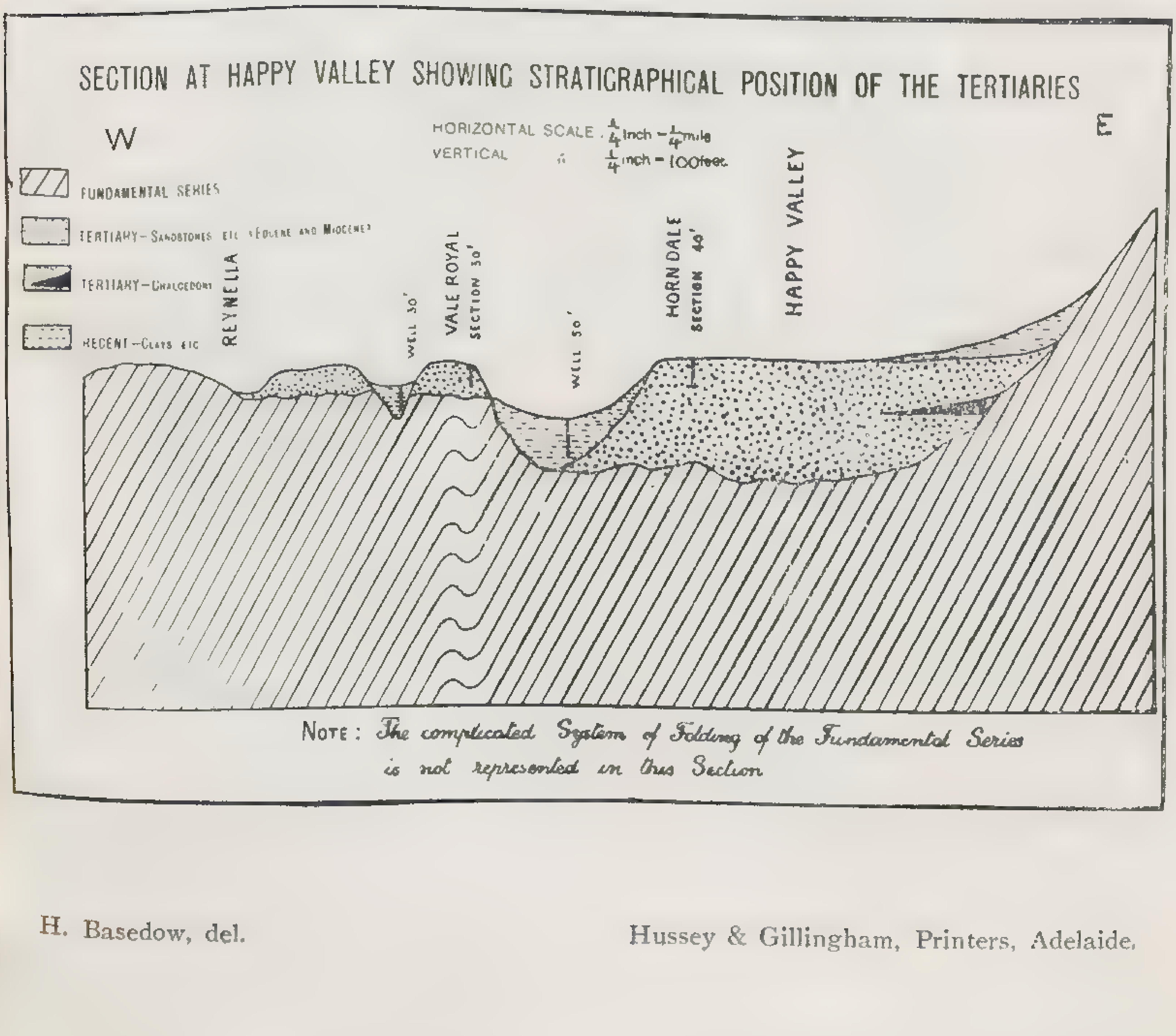

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H. Basedow, Photo.

EXPOSURE OF TERTIARY SANDSTONE, HAPPY VALLEY, S.A.

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W.

E

Photo. by Mr. J. [illegible].]

GREAT ANTICLINE, FIELD RIVER.

E.

W.

Photo. by Mr. J Greenlees.]

OVERFOLD, FIELD RIVER.

E.

W.

Photo. by Mr. J. Greenlees.]

CONTORTED ROCKS, CURLEW POINT (North Side).

E.

W.

Photo. by Mr. J. Greenlees.]

CONTORTED ROCKS, CURLEW POINT (North Side).

W.

E.

Photo. by Mr. J Greenlees.]

CONTORTED ROCKS, CURLEW POINT (South Side).

E.

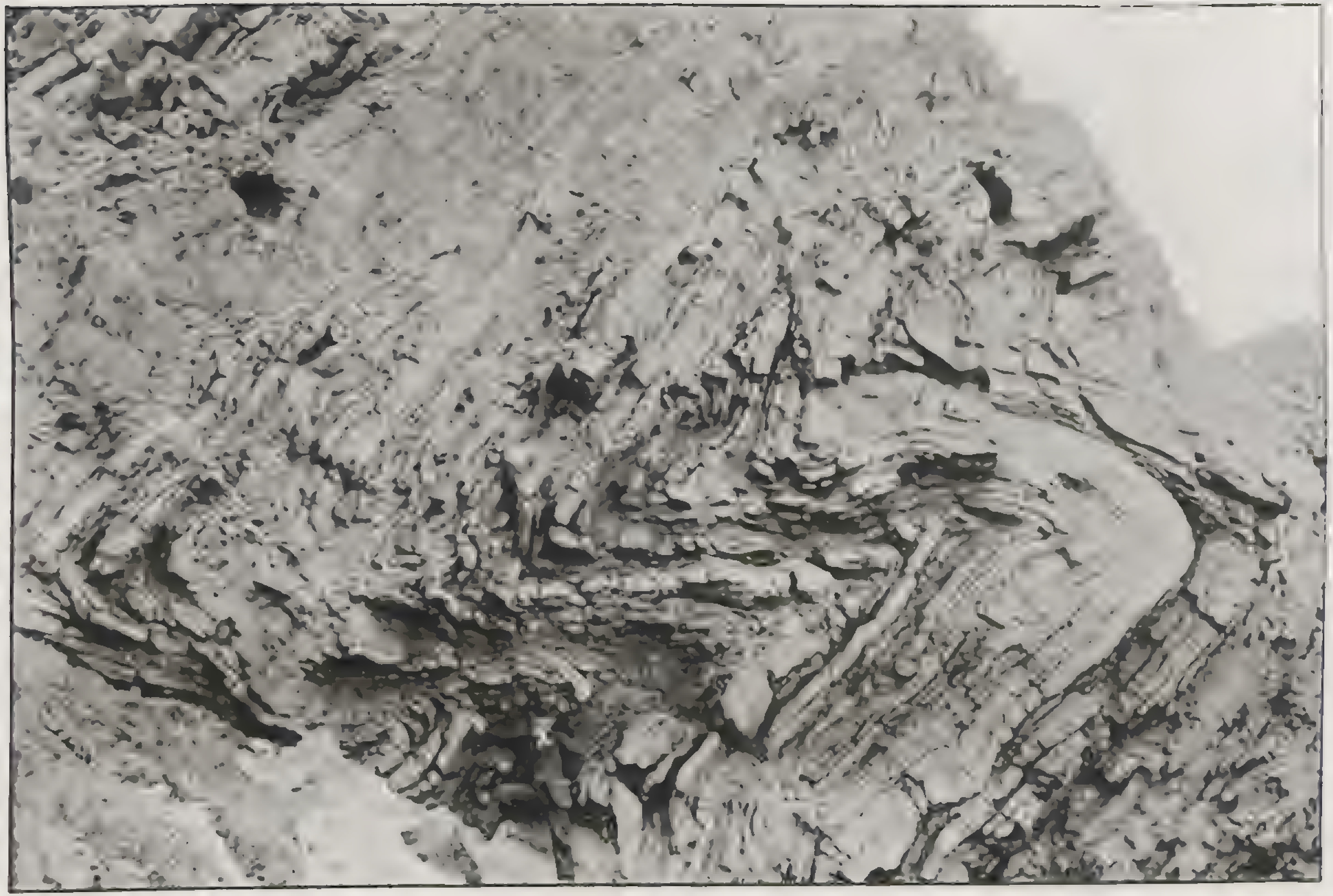

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Photo. by Mr. J. Greenlees.]

CONTORTED ROCKS. ONE-EIGHTH MILE NORTH OF CURLEW POINT

THE GEOLOGY OF THE MOUNT LOFTY RANGES (PART I.)

Roy. Soc. S. Aus. Vol. XXVIII. Plate XLIII.

By Walter Howchin, F.G.S.

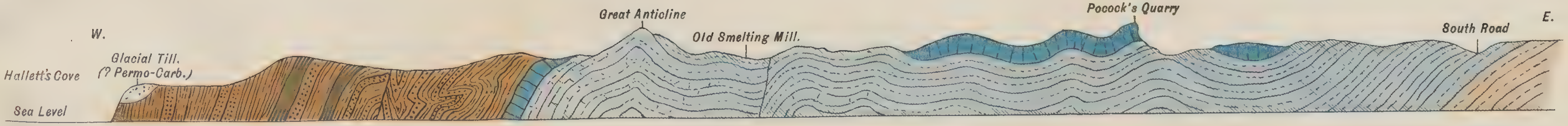

Fig. I. Section in Field River from South Road to Hallett's Cove. Length, 3½ Miles,

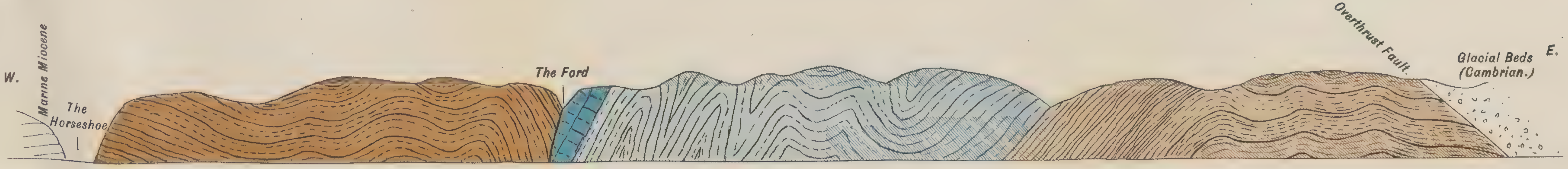

Fig. II. Section in the Onkaparinga River from the Horseshoe (Noarlunga), to the outcrop of Glacial Beds. Length. 4½ Miles.

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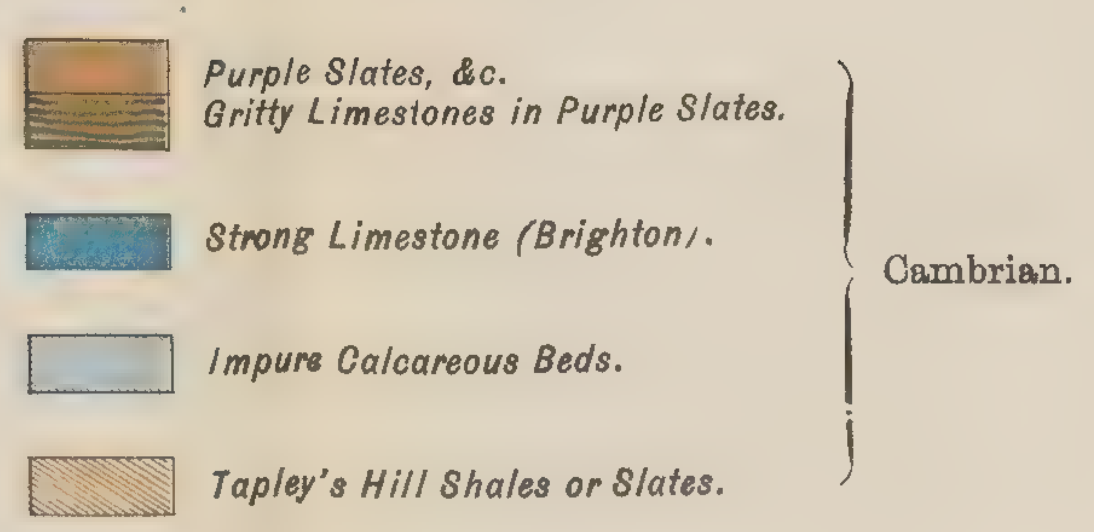


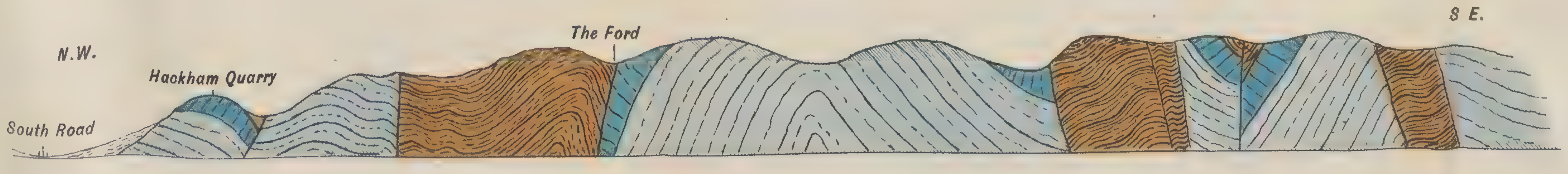


Fig. III. Section A, as shown on Map, from South Road to Long Gully. Length, 1¾ Miles.

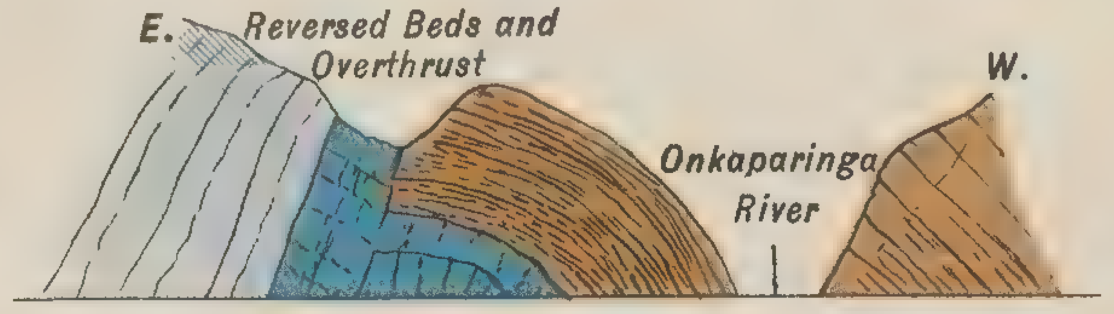


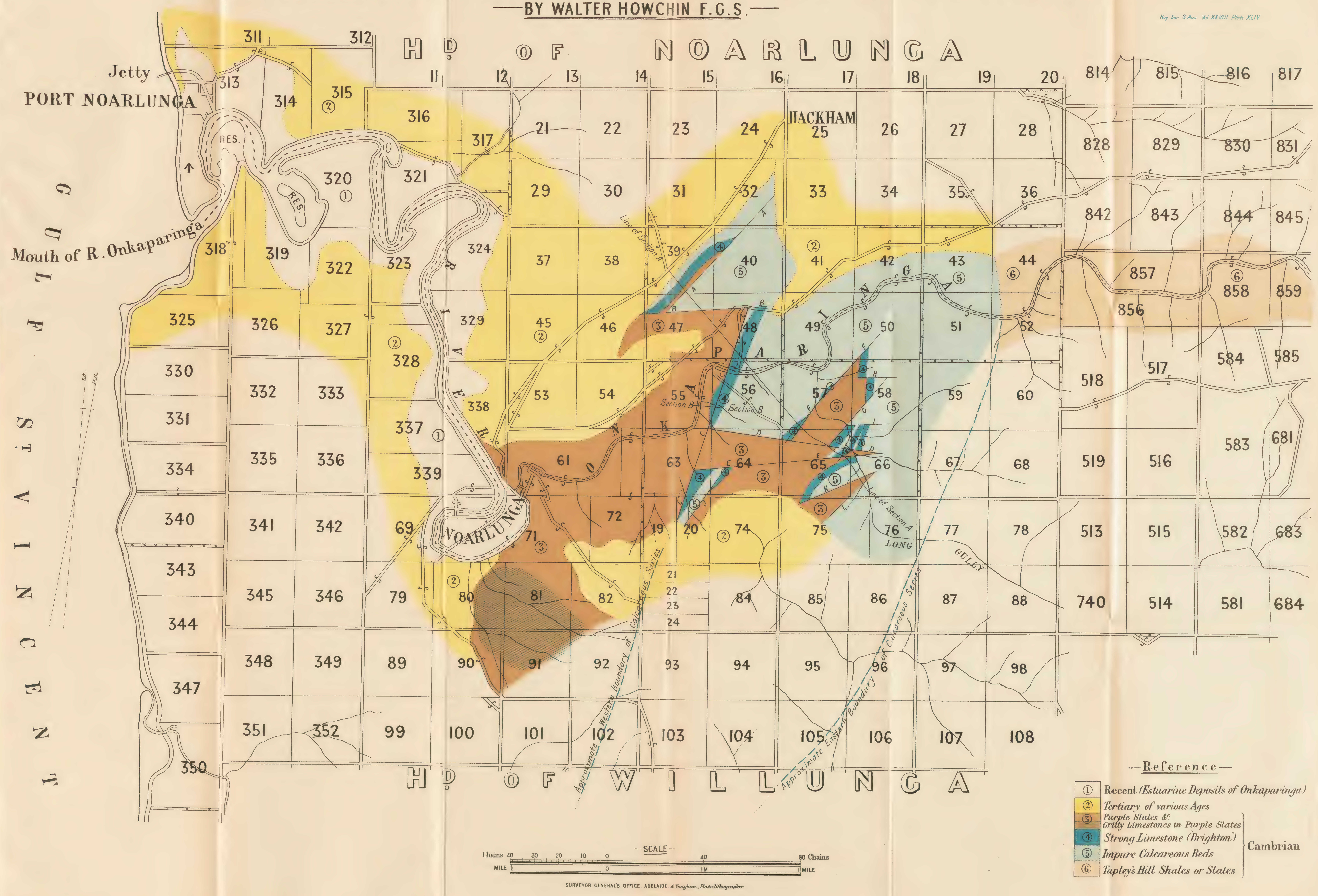
Fig. IV. Section B, in First Gully, below the Ford.

SURVEYOR GENERALS OFFICE ADELAIDE A. Vaughan, Photo-lithographer

THE GEOLOGY OF THE MOUNT LOFTY RANGES (PART 1)

—BY WALTER HOWCHIN F.G.S.—

Roy. Soc. S. Aus. Vol XXVIII, Plate XLIV.



CONTENTS.

PAGE.

Dennant, J.: Recent Corals from the South Australian and Victorian Coasts. Plates i. and ii. 1

Basedow, H.: Anthropological Notes made on the South Australian Government North-West Prospecting Expedition, 1903. Plates iii. to xxi. 12

Dennant, J.: Descriptions of New Species of Corals from the Australian Tertiaries. Plates xxii. to xxv. ... 52

Lea, Arthur M.: Descriptions of Australian Curculionidæ, with Notes on Previously Described Species. Part ii. ... 77

Verco, Dr. Jos. C.: Notes on South Australian Marine Mollusca, with Descriptions of New Species. Part i. Plate xxvi. 135

Baker, W. H.: Notes on South Australian Decapod Crustacea. Plates xxvii. to xxxi. 146

Tepper, J. G. O.: Descriptions of Some New Species of Orthoptera from North-Western South Australia. No. 1. Plate xxxii. 162

Lower, Oswald B.: Descriptions of New Species of Australian Elachistidæ, etc. 168

Woolnough, W. G.: Petrographical Description of Some Varieties of Granite from near Olary, South Australia 181

Woolnough, W. G.: Petrographical Notes on Some South Australian Quartzites, Sandstones, and Related Rocks. Plates xxxiii. and xxxiv. 193

Turner, Dr. A. J.: New Australian Lepidoptera, with Synonymic and other Notes 212

Basedow, H.: Note on Tertiary Exposures in the Happy Valley District, with Description of a New Species of *Septifer*. Plates xxxv. and xxxvi. 248

Howchin, W.: The Geology of the Mount Lofty Ranges. Part i., The Coastal District. Plates xxxvii. to xliv. 253

Blackburn, Rev. T.: Further Notes on Australian Coleoptera, with Descriptions of New Genera and Species (xxxiv.) 281

Bragg, Prof. W. H.: On the Absorption of α Rays, and on the Classification of the α Rays of Radium 298

Abstract of Proceedings 300

Annual Report 306

Balance Sheet 308

Donations to the Library 309

List of Fellows, etc. 315

APPENDICES.

Proceedings, Annual Report, etc., of the Field Naturalists' Section 318

Sixteenth Annual Report of the Native Fauna and Flora Protection Committee of the Field Naturalists' Section 322

Report, etc., of the Malacological Section 324

Report, etc., of the Microscopical Section 325

Index 326

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